National Aeronautics and Space Administration
Langley Research Center
Scientific and Technical Information Program Office

Scientific and Technical Aerospace Reports

STAR

Volume 44 Issue 15

July 31, 2006

WHAT'S INSIDE

NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA scientific and technical information (STI) program plays a key part in helping NASA maintain this important role.

The NASA STI program operates under the auspices of the Agency Chief Information Officer. It collects, organizes, provides for archiving, and disseminates NASA's STI. The NASA STI program provides access to the NASA Aeronautics and Space Database and its public interface, the NASA Technical Report Server, thus providing one of the largest collections of aeronautical and space science STI in the world. Results are published in both non-NASA channels and by NASA in the NASA STI Report Series, which includes the following report types:

- TECHNICAL PUBLICATION. Reports of completed research or a major significant phase of research that present the results of NASA Programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.

- TECHNICAL MEMORANDUM. Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.

- CONTRACTOR REPORT. Scientific and technical findings by NASA-sponsored contractors and grantees.

- CONFERENCE PUBLICATION. Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or co-sponsored by NASA.

- SPECIAL PUBLICATION. Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.

- TECHNICAL TRANSLATION. English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services also include creating custom thesauri, building customized databases, and organizing and publishing research results.

For more information about the NASA STI program, see the following:

- Access the NASA STI program home page at *http://www.sti.nasa.gov*

- E-mail your question via the Internet to *help@sti.nasa.gov*

- Fax your question to the NASA STI Help Desk at (301) 621-0134

- Phone the NASA STI Help Desk at (301) 621-0390

- Write to:
  NASA STI Help Desk
  NASA Center for AeroSpace Information
  7121 Standard Drive
  Hanover, MD 21076-1320

Introduction

Scientific and Technical Aerospace Reports (*STAR*) is an online information resource listing citations and abstracts of NASA and world wide aerospace-related STI. Updated biweekly, *STAR* highlights the most recent additions to the NASA Aeronautics and Space Database. Through this resource, the NASA STI Program provides timely access to the most current aerospace-related Research & Development (R&D) results.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and application, as well as aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation and other topics of high national priority. The listing is arranged first by 11 broad subject divisions, then within these divisions by 76 subject categories and includes two indexes: subject and author.

STAR includes citations to Research & Development (R&D) results reported in:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institution, universities, and private firms
- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

The NASA STI Program

The NASA Scientific and Technical Information (STI) Program was established to support the objectives of NASA's missions and research to advance aeronautics and space science. By sharing information, the NASA STI Program ensures that the U.S. maintains its preeminence in aerospace-related industries and education, minimizes duplication of research, and increases research productivity.

Through the NASA Center for AeroSpace Information (CASI), the NASA STI Program acquires, processes, archives, announces and disseminates both NASA's internal STI and world-wide STI. The results of 20th and 21st century aeronautics and aerospace research and development, a worldwide investment totaling billions of dollars, have been captured, organized, and stored in the NASA Aeronautics and Space Database. New information is continually announced and made available as it is acquired, making this a dynamic and historical collection of value to business, industry, academia, federal institutions, and the general public.

The STI Program offers products and tools that allow efficient access to the wealth of information derived from global R&D efforts. In addition, customized services are available to help tailor this valuable resource to meet your specific needs.

For more information on the most up to date NASA STI, visit the STI Program's website at http://www.sti.nasa.gov.

NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at help@sti.nasa.gov. Others should visit the program at www.sti.nasa.gov. The 'search selected databases' button provides access to the NASA Technical Reports Server (TRS) – the publicly available contents of the NASA Aeronautics and Space Database.

Each citation in *STAR* indicates a 'Source of Availability'. When CASI is indicated, the user can order this information directly from CASI using the STI Online Order Form or contact help@sti.nasa.gov or telephone the CASI Help Desk at 301-621-0390. Before ordering you may access price code tables for STI documents and videos. When information is not available from CASI, the source of the information is indicated when known.

NASA STI is also available to the public through Federal information organizations. NASA CASI disseminates publicly available NASA STI to the National Technical Information Service (NTIS) and to the Federal Depository Library Program (FDLP) through the Government Printing Office (GPO). In addition, NASA patents are available online from the U.S. Patent and Trademark Office.

National Technical Information Service (NTIS)

The National Technical Information Service serves the American public as a central resource for unlimited, unclassified U.S. Government scientific, technical, engineering, and business related information. For more than 50 years NTIS has provided businesses, universities, and the public timely access to well over 2 million publications covering over 350 subject areas. Visit NTIS at http://www.ntis.gov.

The Federal Depository Library Program (FDLP)

The U.S. Congress established the **Federal Depository Library Program** (FDLP) to ensure access by the American public to U.S. Government information. The program acquires and disseminates information products from all three branches of the U.S. Government to nearly 1,300 Federal depository libraries nationwide. The libraries maintain these information products as part of their existing collections and are responsible for assuring that the public has free access to the information. Locate the Federal Depository Libraries http://www.access.gpo.gov/su_docs.

The U.S. Patent and Trademark Office (USPTO)

The U.S. Patent and Trademark Office provides online access to full text patents and patent applications. The database includes patents back to 1976 plus some pre-1975 patents. Visit the USPTO at http://www.uspto.gov/patft/.

Table of Contents

Subject Divisions/Categories

Document citations are grouped by division and then by category, according to the *NASA Scope and Subject Category Guide.*

Aeronautics

Astronautics

Chemistry and Materials

Engineering

Geosciences

Life Sciences

Mathematical and Computer Sciences

Physics

Social and Information Sciences

Space Sciences

General

Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also select either of the two indexes provided for linking to the corresponding document citation from *NASA Thesaurus* terms and personal author names.

Subject Term Index

Personal Author Index

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 44, JULY 31, 2006

02
AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans, and other elements of turbomachinery. For related information see also 34 Fluid Mechanics and Thermodynamics.

20060021583 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China
Transactions of Nanjing University of Aeronautics and Astronautics, Vol. 23, No. 1, March 2006
Dewang, L.; Mar. 2006; 80 pp.; In Chinese
Report No.(s): PB2006-109196; Copyright; Avail.: National Technical Information Service (NTIS)

;Contents: Effects of Incoming Flow Asymmetry on Shock Train Structures in Constant-Area Isolators; Evolution Analysis of TS Wave and High-Order Harmonic Waves in Boundary Layers; New Rod-Shaped Ultrasonic Micromotor and Its Driving Principle; Heuristic Particle Swarm Optimization Algorithm for Air Combat Decision-Making on CMTA; Three-Phase Bridge Inverter for 9 kW Doubly Salient Permanent Magnet Motor; Low Cost Implementation of Speed Sensorless Induction Motor Control Using Stator Flux Orientation; Design and Realization of SINS/Two-Antenna GPS Integrated Navigation System; Secure Data Synchronization Exchange Service Application Program Interface Based on SyncML Protocol; Fast Screening Out True Negative Regions for Microcalcification Detection in Digital Mammograms; Hardware-Based Voxelization for True 3-D Display; Vehicle Segmentation and Shadow Handler Based on Extremum Image; Investigation of Foam-Metal Interface Behaviors During Mold Filling of Magnesium Alloy LFC Process.
NTIS
Aeronautics; Astronautics

20060021897 Purdue Univ., West Lafayette, IN USA
Hypersonic Boundary-Layer Transition Research in the Boeing/AFOSR Mach-6 Quiet Tunnel
Schneider, Steven P; Mar 14, 2006; 13 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0030
Report No.(s): AD-A448081; No Copyright; Avail.: CASI: A03, Hardcopy

This grant was redirected to focus on the search for high-Reynolds-number quiet flow in the Boeing/AFOSR Mach-6 Quiet Tunnel at Purdue. Quiet flow with freestream noise levels comparable to flight requires maintaining laminar nozzle-wall boundary layers; this becomes increasingly difficult, and increasingly useful, as the Reynolds number increases. After nearly five years of shakedown, quiet flow was finally achieved to a freestream unit Reynolds number of 2.8 million per foot, in early 2006. Although this is 90% of the prefabrication design value, it is achieved only intermittently. The masimum feasible quiet-flow Reynolds number remains to be determined, along with the conditions for achieving it reliably. Nevertheless, the facility is presently the only hypersonic quiet tunnel, anywhere in the world, and affordable operating costs have been maintained.
DTIC
Boundary Layer Transition; Free Flow; Hypersonic Boundary Layer; Hypersonic Speed; Hypersonics; Reynolds Number; Turbulent Flow; Wind Tunnels

20060021909 California Inst. of Tech., Pasadena, CA USA
From Fly Models to Flight Control
Dickinson, Michael H; Dec 2005; 9 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0171
Report No.(s): AD-A448114; No Copyright; Avail.: CASI: A02, Hardcopy

In the research covered in this project, we integrated findings from biology to create a bottom-up model of the visual, mechanical, and aerodynamics systems the fruit fly to investigate the above general questions. Couched in the language of control systems, the model allows us to make detailed predictions about fly behavior under a given set of assumptions. Thus, we can simultaneously investigate, on the one hand, the actual strategies employed by the fly, while on the other hand we can evaluate the theoretical performance of various algorithms under a variety of conditions impossible to test in real experiments. We have used the model to generate closed-loop flight in a tunnel geometry.
DTIC
Aerodynamics; Flight Control; Insects

20060022114 NASA Langley Research Center, Hampton, VA, USA
Measurements of Unsteady Wake Interference Between Tandem Cylinders
Jenkins, Luther N.; Neuhart, Dan H.; McGinley, Cahterine B.; Choudhari, Meelan M.; Khorrami, Mehdi R.; [2006]; 18 pp.; In English; 36th AIAA Fluid Dynamics Conference and Exhibit, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 581-02-08; No Copyright; Avail.: CASI: A03, Hardcopy

A multi-phase, experimental study in the Basic Aerodynamics Research Tunnel at the NASA Langley Research Center has provided new insight into the unsteady flow interaction around cylinders in tandem arrangement. Phase 1 of the study characterized the mean and unsteady near-field flow around two cylinders of equal diameter using 2-D Particle Image Velocimetry (PIV) and hot-wire anemometry. These measurements were performed at a Reynolds number of 1.66 x 10(exp 5), based on cylinder diameter, and spacing-to-diameter ratios, L/D, of 1.435 and 3.7. The current phase, Phase 2, augments this dataset by characterizing the surface flow on the same configurations using steady and unsteady pressure measurements and surface flow visualization. Transition strips were applied to the front cylinder during both phases to produce a turbulent boundary layer upstream of the flow separation. For these flow conditions and L/D ratios, surface pressures on both the front and rear cylinders show the effects of L/D on flow symmetry, pressure recovery, and the location of flow separation and attachment. Mean streamlines and instantaneous vorticity obtained from the PIV data are used to explain the flow structure in the gap and near-wake regions and its relationship to the unsteady surface pressures. The combination of off-body and surface measurements provides a comprehensive dataset to develop and validate computational techniques for predicting the unsteady flow field at higher Reynolds numbers.
Author
Wakes; Flow Distribution; Pressure Measurement; Unsteady Flow; Upstream; Turbulent Boundary Layer; Reynolds Number; Aerodynamic Interference

20060022121 NASA Langley Research Center, Hampton, VA, USA
Wind Tunnel Application of a Pressure-Sensitive Paint Technique to a Double Delta Wing Model at Subsonic and Transonic Speeds
Erickson, Gary E.; Gonzalez, Hugo A.; May 2006; 322 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 23-721-10-66
Report No.(s): NASA/TM-2006-214319; L-19268; No Copyright; Avail.: CASI: A14, Hardcopy

A pressure-sensitive paint (PSP) technique was applied in a wind tunnel experiment in the NASA Langley Research Center 8-Foot Transonic Pressure Tunnel to study the effect of wing fillets on the global vortex induced surface static pressure field about a sharp leading-edge 76 deg./40 deg. double delta wing, or strake-wing, model at subsonic and transonic speeds. Global calibrations of the PSP were obtained at M(sub infinity) = 0.50, 0.70, 0.85, 0.95, and 1.20, a Reynolds number per unit length of 2.0 million, and angles of attack from 10 degrees to 20 degrees using an insitu method featuring the simultaneous acquisition of electronically scanned pressures (ESP) at discrete locations on the model. The mean error in the PSP measurements relative to the ESP data was approximately 2 percent or less at M(sub infinity) = 0.50 to 0.85 but increased to several percent at M(sub infinity) =0.95 and 1.20. The PSP pressure distributions and pseudo-colored, planform-view pressure maps clearly revealed the vortex-induced pressure signatures at all Mach numbers and angles of attack. Small fillets having parabolic or diamond planforms situated at the strake-wing intersection were respectively designed to manipulate the vortical flows by removing the leading-edge discontinuity or introducing additional discontinuities. The fillets caused global changes in the vortex-dominated surface pressure field that were effectively captured in the PSP measurements. The vortex surface pressure signatures were compared to available off-surface vortex cross-flow structures obtained using a laser vapor screen (LVS) flow visualization technique. The fillet effects on the PSP pressure distributions and the observed leading-edge vortex

flow characteristics were consistent with the trends in the measured lift, drag, and pitching moment coefficients.
Author
Transonic Wind Tunnels; Wind Tunnel Tests; Delta Wings; Pressure Sensitive Paints; Subsonic Speed; Transonic Speed; Aircraft Models

20060022126 NASA Langley Research Center, Hampton, VA, USA
Numerical Issues for Circulation Control Calculations
Swanson, Roy C., Jr.; Rumsey, Christopher L.; 2006; 32 pp.; In English; 3rd AIAA Flow Control Conference, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper 2006-3008; No Copyright; Avail.: CASI: A03, Hardcopy

Steady-state and time-accurate two-dimensional solutions of the compressible Reynolds-averaged Navier- Stokes equations are obtained for flow over the Lockheed circulation control (CC) airfoil and the General Aviation CC (GACC) airfoil. Numerical issues in computing circulation control flows such as the effects of grid resolution, boundary and initial conditions, and unsteadiness are addressed. For the Lockheed CC airfoil computed solutions are compared with detailed experimental data, which include velocity and Reynolds stress profiles. Three turbulence models, having either one or two transport equations, are considered. Solutions are obtained on a sequence of meshes, with mesh refinement primarily concentrated on the airfoil circular trailing edge. Several effects related to mesh refinement are identified. For example, sometimes sufficient mesh resolution can exclude nonphysical solutions, which can occur in CC airfoil calculations. Also, sensitivities of the turbulence models with mesh refinement are discussed. In the case of the GACC airfoil the focus is on the difference between steady-state and time-accurate solutions. A specific objective is to determine if there is self-excited vortex shedding from the jet slot lip.
Author
Circulation Control Airfoils; General Aviation Aircraft; Grid Generation (Mathematics); Boundary Conditions; Velocity Distribution; Reynolds Stress; Steady State; Reynolds Averaging; Navier-Stokes Equation

20060022128 NASA Langley Research Center, Hampton, VA, USA
Stability of Supersonic Boundary Layers Over Blunt Wedges
Balakumar, Ponnampalam; 2006; 20 pp.; In English; 36th AIAA Fluid Dynamics Conference and Exhibit, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations
Report No.(s): AIAA Paper 2006-3053; No Copyright; Avail.: CASI: A03, Hardcopy

Receptivity and stability of supersonic boundary layers over blunt flat plates and wedges are numerically investigated at a free stream Mach number of 3.5 and at a high Reynolds number of 10(exp 6)/inch. Both the steady and unsteady solutions are obtained by solving the full Navier-Stokes equations using the 5th-order accurate weighted essentially non-oscillatory (WENO) scheme for space discretization and using third-order total-variation-diminishing (TVD) Runge-Kutta scheme for time integration. Computations are performed for a flat plate with leading edge thicknesses of 0.0001, 0.001, 0.005 and 0.01 inches that give Reynolds numbers based on the leading edge thickness ranging from 1000 to 10000. Calculations are also performed for a wedge of 10 degrees half angle with different leading edge radii 0.001 and 0.01 inches. The linear stability results showed that the bluntness has a strong stabilizing effect on the stability of two-dimensional boundary layers. The transition Reynolds number for a flat plate with a leading edge thickness of 0.01 inches is about 3.5 times larger than it is for the Blasius boundary layer. It was also revealed that boundary layers on blunt wedges are far more stable than on blunt flat plates.
Author
Supersonic Boundary Layers; Wedges; Stability; Essentially Non-Oscillatory Schemes; Reynolds Number; Supersonic Speed; Leading Edges

20060022150 NASA Dryden Flight Research Center, Edwards, CA, USA
Wind Tunnel Results of the B-52B with the X-43A Stack
Davis, Mark C.; Sim, Alexander G.; Rhode, Matthew; Johnson, Kevin D.; [2006]; 15 pp.; In English; 24th AIAA Applied Aerodynamics Conference, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

A low-speed wind-tunnel test was performed with a three-percent-scale model of a booster rocket mated to an X-43A research vehicle, a combination referred to as the Hyper-X launch vehicle. The test was conducted both in free-stream air and in the presence of a partial model of the B-52B airplane. The objectives of the test were to obtain force and moment data to

generate structural loads affecting the pylon of the B-52B airplane and to determine the aerodynamic influence of the B-52B airplane on the Hyper-X launch vehicle to evaluate launch separation characteristics. The wind-tunnel test was conducted at a low-speed wind tunnel in Hampton, Virginia. All moments and forces reported are based either on the aerodynamic influence of the B-52B airplane or are for the Hyper-X launch vehicle in free-stream air. Overall, the test showed that the B-52B airplane imparts a strong downwash onto the Hyper-X launch vehicle, reducing the net lift of the Hyper-X launch vehicle. Also, pitching and rolling moments are imparted onto the booster and are a strong function of the launch-drop angle of attack.
Author
Wind Tunnel Tests; Scale Models; Launch Vehicles; B-52 Aircraft; Angle of Attack; Rolling Moments; Pitching Moments; Low Speed

20060022154 NASA Langley Research Center, Hampton, VA, USA
Assessment of an Unstructured-Grid Method for Predicting Aerodynamic Performance of Jet Flaps
Cruz, Josue; Anders, Scott G.; 2006; 13 pp.; In English; 24th AIAA Applied Aerodynamics Conference, 5-8 Jun. 2006, San Francisco, CA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 581-02-08-07
Report No.(s): AIAA Paper 2006-3868; No Copyright; Avail.: CASI: A03, Hardcopy

The application of a Computational Fluid Dynamics tool to a jet flap control effector on an elliptical airfoil-section wing was investigated. The study utilized the Tetrahedral Unstructured Software System developed at NASA Langley Research Center. The Reynolds-averaged Navier-Stokes flow solver code used was USM3D. The CFD-based jet flap simulations were compared to experimental results from a wind tunnel test conducted at the NASA Langley Transonic Dynamics Tunnel. The wind tunnel model consisted of a six percent thick elliptical airfoil with a modified trailing edge. The jet flap was located at 95% chord and exited at 90 degrees to the lower surface. The experimental model was designed to promote two-dimensional flow across the wing. It was found that the CFD simulation had to model the three-dimensional geometry of the experiment in order to obtain good agreement. Tests were performed at two Mach numbers at several different jet momentum coefficients. In order to be consistent with the experimental method, the CFD lift and pitching moment values were determined by integrating the pressures over the wing.
Author
Aerodynamic Characteristics; Computational Fluid Dynamics; Jet Flaps; Unstructured Grids (Mathematics); Wind Tunnel Tests

20060022551 NASA Langley Research Center, Hampton, VA, USA
Convergence Acceleration for Multistage Time-Stepping Schemes
Swanson, R. C.; Turkel, Eli L.; Rossow, C-C; Vasta, V. N.; 2006; 21 pp.; In English; 36th AIAA Fluid Dynamics Conference and Exhibit, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08
Report No.(s): AIAA Paper 2006-3523; Copyright; Avail.: CASI: A03, Hardcopy

The convergence of a Runge-Kutta (RK) scheme with multigrid is accelerated by preconditioning with a fully implicit operator. With the extended stability of the Runge-Kutta scheme, CFL numbers as high as 1000 could be used. The implicit preconditioner addresses the stiffness in the discrete equations associated with stretched meshes. Numerical dissipation operators (based on the Roe scheme, a matrix formulation, and the CUSP scheme) as well as the number of RK stages are considered in evaluating the RK/implicit scheme. Both the numerical and computational efficiency of the scheme with the different dissipation operators are discussed. The RK/implicit scheme is used to solve the two-dimensional (2-D) and three-dimensional (3-D) compressible, Reynolds-averaged Navier-Stokes equations. In two dimensions, turbulent flows over an airfoil at subsonic and transonic conditions are computed. The effects of mesh cell aspect ratio on convergence are investigated for Reynolds numbers between 5.7 x 10(exp 6) and 100.0 x 10(exp 6). Results are also obtained for a transonic wing flow. For both 2-D and 3-D problems, the computational time of a well-tuned standard RK scheme is reduced at least a factor of four.
Author
Runge-Kutta Method; Computational Grids; Turbulent Flow; Navier-Stokes Equation; Reynolds Averaging; Aspect Ratio; Airfoils

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; airport ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation. For related information see also 16 Space Transportation and Safety and 85 Technology Utilization and Surface Transportation.

20060021437 Naval Surface Warfare Center, Indian Head, MD USA
Digital Recovery Sequencer - Advanced Concept Ejection Seats
Ross, David A; Cotter, Lee; Culhane, David; Press, Matthew J; Oct 2005; 47 pp.; In English; Original contains color illustrations
Report No.(s): AD-A446498; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA446498; Avail.: CASI: A03, Hardcopy

The Advanced Concept Ejection Seat (ACES) currently uses the Analog Sequencer, designed in the 1960's and 1970's with analog technology, to control ejection event timing and ejection mode selection. Continued usage of the Analog Sequencer is undesirable due to limitations with respect to its installed life, electronic component obsolescence, flexibility to accommodate seat safety improvements, and mode differentiation capability at the Mode 1 to 2 crossover point. The Digital Recovery Sequencer (DRS) program was undertaken by Goodrich, the seat Original Equipment Manufacturer (OEM), and the Cartridge Actuated Device/Propellant Actuated Device (CAD/PAD) Joint Program Office (JPO) to design and qualify a sequencer based on digital technology as a replacement for the Analog Sequencer. The DRS program was established with three phases: Phase I for requirements definition and supplier selection, Phase II for design and qualification, and Phase III for pre-planned production improvements (P3I). Phase I was completed in 2003. Phase II is complete through design, firmware verification, component qualification, and sled testing. Phase II is on track to conclude with approval of the Safe-to-Fly certification in October 2005. The DRS is in the early stages of production with deliveries scheduled for the 4th Quarter of 2005 and the 2nd Quarter of 2006. The program progress to-date, the DRS design including its safety related improvement, and results from the DRS firmware verification, component qualification, and sled tests are presented herein.
DTIC
Digital Systems; Ejection Seats; Sequential Control; Sleds

20060021614 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Fiscal Year 2006 Business Plan: Aviation Policy, Planning and Environment
January 2006; 28 pp.; In English
Report No.(s): PB2006-112108; No Copyright; Avail.: CASI: A03, Hardcopy

The Office of Aviation Policy, Planning, and Environment (AEP) provides critical support to the Administrator and FAA organizations in two major program areas: 1. Planning and policy development 2. Environment and energy programs. AEP carries out its goals as the agency's focal point for strategic and business plan development and coordination by: 1. Identifying policy issues 2. Developing, recommending and coordinating national aviation policy related to FAA authority 3. National airport and airway system development, operation, and finance; and environmental and energy matters
NTIS
Commerce; Management Planning; Policies

20060021617 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Fiscal Year 2006 Business Plan: Communications
January 2006; 12 pp.; In English
Report No.(s): PB2006-112113; No Copyright; Avail.: CASI: A03, Hardcopy

FAA Communications works with the news media to provide the public with accurate, timely, useful and important information about the agency's goals, policies, activities and operations. As part of that mission, Communications actively promotes FAA activities that deal with Safety, Capacity, International Leadership and Organizational Excellence.
NTIS
Air Transportation; Commerce

20060021621 Hughes Technical Center, Atlantic City International Airport, NJ, USA
Development of a Standardized Fire Source for Aircraft Cargo Compartment Fire Detection Systems
Blake, D.; May 2006; 34 pp.; In English
Report No.(s): PB2006-112223; No Copyright; Avail.: National Technical Information Service (NTIS)

This report documents the development and testing of a standardized fire source for cargo compartment fire detection systems. Note that currently, these fire sources cannot be used in actual certification flight tests. The intent of this work was to define a fire source in terms of heat release rate, mass loss rate, and smoke and gas species production rates, and then devise a safe method to simulate whichever aspect of the fire signature that the particular detection system was designed to respond to in the certification tests. This could be done singly or in some combination with smoke generators, heat guns, and the controlled release of actual or surrogate gas species. This report discusses how this fire source is used in a computational fluid dynamics model to predict the transport of smoke, gases, and heat throughout a cargo compartment. The testing concluded that the fire source used in a simulated smoldering fire mode does not produce a fire signature that would be useful in developing multicriteria fire detectors with a better capability to resist false alarms. This report also documents the amount of smoke that would be detectable in various size cargo compartments and the resultant responses of currently in-use aircraft smoke detectors from the simulated smoldering and flaming fires.
NTIS
Air Cargo; Cargo; Compartments; Detection; Fires; Standardization

20060021623 Hughes Technical Center, Atlantic City International Airport, NJ, USA
Installation Criteria for Taxiway Centerline Lights
Patterson, J. W.; May 2006; 26 pp.; In English
Report No.(s): PB2006-112224; No Copyright; Avail.: National Technical Information Service (NTIS)
Research was conducted to evaluate the suitability of using Federal Aviation Administration (FAA) type L-852D taxiway centerline lights on curved taxiways at a nonstandard spacing distance of 25 feet. Typically, the type L-852D taxiway centerline fixture, when used on taxiways with radii between 75 and 399 feet, is spaced at 12.5 feet. The International Civil Aviation Organization (ICAO) uses a fixture that is designed specifically for curved applications that allows for a longer spacing requirement of 25 feet. New York's La Guardia Airport, in their Surface Movement Guidance and Control System plan being prepared for minimum authorized operations under 1200-feet runway visual range, proposes the installation of the FAA type L-852D taxiway centerline lights using the 25-feet spacing requirements of ICAO. The objective of this research was to evaluate the required longitudinal spacing for both the FAA type L-852D and ICAO taxiway centerline lights, considering notable differences in design, photometrics, and mounting orientation of the two fixtures.
NTIS
Illuminating; Installing; Luminaires; Runways

20060021630 National Transportation Safety Board, Washington, DC USA
National Transportation Safety Board Aircraft Accident Report: Crash During Approach to Landing Air Tahoma, Inc., Flight 185, Convair 580, N586P, Covington, Kentucky on August 13, 2004
May 02, 2006; 80 pp.; In English
Report No.(s): PB2006-910403; NTSB/AAR-06/03; No Copyright; Avail.: CASI: A05, Hardcopy
This report explains the accident involving Air Tahoma, Inc., flight 185, a Convair 580, N586P, that crashed about 1 mile south of Cincinnati/Northern Kentucky International Airport, Covington, Kentucky, while on approach to runway 36R. Safety issues discussed in this report focus on flight crew performance, fuel crossfeed operations, operating with different fuel boost pump output pressure settings, and cockpit voice recorder power source reliability. Safety recommendations concerning these issues are addressed to the Federal Aviation Administration. A safety recommendation concerning operating with different fuel boost pump output pressure settings is addressed to Transport Canada.
NTIS
Accident Investigation; Crashes; Safety Management; Transportation

20060021686 Illinois Univ. at Urbana-Champaign, Urbana, IL USA
Aviation Display Support for Situation Awareness
Wickens, Christopher D; Olmos, Oscar; Chudy, Andrew; Davenport, Clark; Jul 1997; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F41624-94-D-6000
Report No.(s): AD-A447738; ARL-97-10/LOGICON-97-2; No Copyright; ONLINE:
http://hdl.handle.net/100.2/ADA447738; Avail.: CASI: A03, Hardcopy
In this report, three prototype displays that are contrasted for aircraft navigation and tactical hazard awareness: a conventional 2D coplanar display, an exocentric ('God's eye') 3D display, and an immersed ('pilot's eye') 3D display.

Strengths and weaknesses of each display type are discussed. In implementing these for Experiment 1, the immersed display was coupled with a global exocentric view of the airspace. In Experiment 1, thirty pilots flew with each of the displays around an airspace populated by waypoints, hazards and traffic. Performance measures revealed the anticipated costs and benefits of each display type. In Experiment 2, cognitive engineering principles were applied to remediate the weaknesses of each display type. Analysis of performance of 27 additional participants in flight path tracking and hazard awareness measures revealed success in application of the cognitive engineering principles. We also briefly describe the procedures employed in a third experiment in which additional design changes were examined.
DTIC
Display Devices; Flight Paths; Flight Tests; Navigation; Situational Awareness

20060021801 Boeing Co., Mesa, AZ USA
AH-64D Apache Longbow Network Centric Operations in a Coalition Environment
Parry, Sam H; Jun 23, 2005; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447890; No Copyright; Avail.: CASI: A03, Hardcopy

Presentation on AH-64D Apache Longbow Network Centric Operations in a Coalition Environment. A combined arms coalition force enabled with interoperable network centric (enabled) technology is extremely effective on the modern battlefield, allowing force to develop situation and engage out of contact, mass effects not forces, synchronized operations.
DTIC
Interoperability; Military Operations

20060021852 General Dynamics Advanced Information Systems, Dayton, OH USA
Assessing the Mission Effectiveness of Morphing Aircraft Structures Technologies in Hunter/Killer Operations; Utilization of Small UAVS for Hunter/Killer Mission
Brown, Terry; Martin, Eric; Jun 23, 2005; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447971; No Copyright; Avail.: CASI: A03, Hardcopy

Presentation on assessing the mission effectiveness of morphing aircraft structures technologies in Hunter/Killer operations, specifically utilization of small UAVs for the Hunter/Killer mission. Outline of the presentation is: Introduction; UAV concept definitions; SEAS Modeling; Results; Conclusions.
DTIC
Drone Vehicles; System Effectiveness

20060021946 QSS Group, Inc., Cleveland, OH, USA
Further Refinement of the LEWICE SLD Model
Wright, William B.; May 2006; 29 pp.; In English; 44th Aerospace Sciences Meeting and Exhibit, 9-12 Jan. 2006, Reno, NV, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS3-00145; WBS 280-02-07-03-02
Report No.(s): NASA/CR-2006-214132; AIAA Paper 2006-0464; E-15466; No Copyright; Avail.: CASI: A03, Hardcopy

A research project is underway at NASA Glenn Research Center to produce computer software that can accurately predict ice growth for any meteorological conditions for any aircraft surface. This report will present results from version 3.2 of this software, which is called LEWICE. This version differs from previous releases in that it incorporates additional thermal analysis capabilities, a pneumatic boot model, interfaces to external computational fluid dynamics (CFD) flow solvers and has an empirical model for the supercooled large droplet (SLD) regime. An extensive comparison against the database of ice shapes and collection efficiencies that have been generated in the NASA Glenn Icing Research Tunnel (IRT) has also been performed. The complete set of data used for this comparison will eventually be available in a contractor report. This paper will show the differences in collection efficiency and ice shape between LEWICE 3.2 and experimental data. This report will first describe the LEWICE 3.2 SLD model. A semi-empirical approach was used to incorporate first order physical effects of large droplet phenomena into icing software. Comparisons are then made to every two-dimensional case in the water collection database and the ice shape database. Each collection efficiency condition was run using the following four assumptions: 1) potential flow, no splashing; 2) potential flow, with splashing; 3) Navior-Stokes, no splashing; 4) Navi r-Stokes, with splashing. All cases were run with 21 bin drop size distributions and a lift correction (angle of attack adjustment). Quantitative comparisons are shown for impingement limit, maximum water catch, and total collection efficiency. Due to the large number of ice shape cases, comprehensive comparisons were limited to potential flow cases with and without splashing. Quantitative comparisons are shown for horn height, horn angle, icing limit, area, and leading edge thickness. The results show that the

predicted results for both ice shape and water collection are within the accuracy limits of the experimental data for the majority of cases.
Author
Ice Formation; Drop Size; Computational Fluid Dynamics; Thermal Analysis; Size Distribution; Computer Programs; Angle of Attack

20060022119 NASA Langley Research Center, Hampton, VA, USA
A Description of the 'Crow's Foot' Tunnel Concept
Parrish, Russell V.; Williams, Steven P.; Arthur, Jarvis J., III; Kramer, Lynda J.; Bailey, Randall E.; Prinzel, Lawrence J., III; Norman, R. Michael; June 2006; 36 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2006-214311; L-19266; No Copyright; Avail.: CASI: A03, Hardcopy

NASA Langley Research Center has actively pursued the development and the use of pictorial or three-dimensional perspective displays of tunnel-, pathway- or highway-in-the-sky concepts for presenting flight path information to pilots in all aircraft categories (e.g., transports, General Aviation, rotorcraft) since the late 1970s. Prominent among these efforts has been the development of the crow s foot tunnel concept. The crow's foot tunnel concept emerged as the consensus pathway concept from a series of interactive workshops that brought together government and industry display designers, test pilots, and airline pilots to iteratively design, debate, and fly various pathway concepts. Over years of use in many simulation and flight test activities at NASA and elsewhere, modifications have refined and adapted the tunnel concept for different applications and aircraft categories (i.e., conventional transports, High Speed Civil Transport, General Aviation). A description of those refinements follows the definition of the original tunnel concept.
Author
General Aviation Aircraft; Civil Aviation; Rotary Wing Aircraft; Flight Paths; Rectangular Wind Tunnels

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 06 Avionics and Aircraft Instrumentation; 17 Space Communications, Spacecraft Communications, Command and Tracking; and 32 Communications and Radar.

20060022173 NASA Ames Research Center, Moffett Field, CA, USA
Using Neural Networks to Explore Air Traffic Controller Workload
Martin, Lynne; Kozon, Thomas; Verma, Savita; Lozito, Sandra C.; [2006]; 5 pp.; In English; 7th International Conference on Cognitive Modeling, 5-8 apr. 2006, Trieste, Italy; Original contains black and white illustrations
Contract(s)/Grant(s): NCC2-1378; No Copyright; Avail.: CASI: A01, Hardcopy

When a new system, concept, or tool is proposed in the aviation domain, one concern is the impact that this will have on operator workload. As an experience, workload is difficult to measure in a way that will allow comparison of proposed systems with those already in existence. Chatterji and Sridhar (2001) suggested a method by which airspace parameters can be translated into workload ratings, using a neural network. This approach was employed, and modified to accept input from a non-real time airspace simulation model. The following sections describe the preparations and testing work that will enable comparison of a future airspace concept with a current day baseline in terms of workload levels.
Author
Neural Nets; Workloads (Psychophysiology); Airspace; Air Traffic Controllers (Personnel)

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance and evaluation, and aircraft and flight simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles see 85 Technology Utilization and Surface Transportation.

20060021619 California Univ., Berkeley, CA USA
Statistical Testing of Aircraft Materials for Transport Airplane Rotor Burst Fragment Shielding
Kelley, S.; Johnson, G.; May 2006; 116 pp.; In English
Report No.(s): PB2006-112222; No Copyright; Avail.: National Technical Information Service (NTIS)

Fragment barrier systems are being examined and developed for commercial airplanes to prevent accidents as a result of an engine rotor burst failure. To use this system, it is necessary to understand how the existing aircraft materials behave under ballistic impact. The material response of 0.063, 0.125, and 0.25-inch-thick 2024 aluminum, 0.25-inch-thick Makrolon polycarbonate, and sandwich composite panels were investigated under ballistic impact. Failure modes were evaluated and ballistic limits obtained for each set of targets. The testing was done in the UC Berkeley Ballistics Laboratory using a gas gun, and a powder gun setup with a 1/2-inch diameter chrome steel spherical projectile. This report documents the testing and analysis of the UC Berkeley ballistic testing. The testing yielded excellent results on aluminum but more data is needed for titanium, composites, and polycarbonate materials.
NTIS
Fragments; Gas Turbines; Rotors; Shielding; Transport Aircraft

20060021632 Office National d'Etudes et de Recherches Aerospatiales, Paris, France
Internal Noise Prediction within Aircraft Cabin
David, Jean-Michael; Oct 1, 2004; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A446807; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA446807; Avail.: CASI: A03, Hardcopy
No abstract available
Aircraft Compartments; Aircraft Noise; Cockpits; Helicopters; Noise Prediction; Prediction Analysis Techniques

20060021675 Arkansas Univ., Fayetteville, AR USA
The Use of Decision Models in the Development of a Collaborative Integrated Solutions Systems
Nachtmann, Heather; Hunter, Justin; Hill, Bryan; Waters, Brian; Rieske, David; King, Jonathan; Collins, Terry R; Dec 2003; 112 pp.; In English
Contract(s)/Grant(s): F33615-99-D-6001
Report No.(s): AD-A447725; PMD0204; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447725; Avail.: CASI: A06, Hardcopy
The Logistics Readiness Program supports the Air Force Research Laboratory, Human Effectiveness Directorate, Warfighter Readiness Research Division, Logistics Readiness Branch (AFRL/HEAL) through the conduct of logistics research studies that leverage the expertise of the academic community. This research is the product of a collaborative project conducted by personnel at AFRL/HEAL and the University of Arkansas. The AFRL/HEAL identified a need to have a strategically aligned performance measurement system for flightline maintenance (MX) activities. This system must account for the entire flightline MX process in order to improve the performance of aircraft scheduling and achievement of mission objectives. The primary project activities were: Identification of a strategically aligned performance measurement system; Research into that system's development and implementation process; Investigation of current flightline MX processes; Production of associated development guidelines; Validation of these guidelines through a case application; Investigation of software implementations.
DTIC
Maintenance; Systems Integration

20060021729 Air Force Research Lab., Wright-Patterson AFB, OH USA
Military Space Plane: Ground Operations Model
Jacobs, Thomas H; Huntley, George M; Smith, Elan T; Garrambone, Michael W; Betts, Frank C; Jun 23, 2005; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447832; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447832; Avail.: CASI: A03, Hardcopy
Presentation on the development of ground operations for a military space plane. Contents include: MSP (military space plane) ground operations; problem statement; modeling considerations; problem solving approach; venture evaluation review technique; system data and analysis; findings and recommendations; summary and POC information.
DTIC
Aerospace Planes; Ground Operational Support System; Military Operations; Military Technology; Research and Development

20060021800 Air Force Research Lab., Wright-Patterson AFB, OH USA

Path Planning in Three Dimensional Environment Using Feedback Linearization (Preprint)

Schumacher, Corey J; Kanchanavally, Shreecharan; Ordonez, Raul; Jan 2006; 9 pp.; In English

Contract(s)/Grant(s): F33615-01-2-3154

Report No.(s): AD-A447872; No Copyright; Avail.: CASI: A02, Hardcopy

This paper presents a control scheme via feedback linearization for three-dimensional cooperative path planning of a class of interconnected systems in general, and unmanned aerial vehicles (UAVs) in particular. It is shown that the feedback linearization technique along with a distance varied repulsive profile allows UAVs to converge to the invariant set of a known target location without colliding with other vehicles. Lyapunov stability analysis shows the conditions under which such systems are stable. Also a task assignment algorithm, which is a function of distance between the UAVs and the target, is proposed for dealing with multi-UAV and multi-target scenarios.

DTIC

Collision Avoidance; Control; Drone Vehicles; Feedback; Flight Paths; Linear Systems; Linearization; Pilotless Aircraft; Planning; Position Sensing; Trajectory Planning

20060021830 General Accounting Office, Washington, DC USA

Defense Acquisitions. Better Acquisition Strategy Needed for Successful Development of the Army's Warrior Unmanned Aircraft System

May 2006; 28 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447937; GAO-06-593; No Copyright; Avail.: CASI: A03, Hardcopy

The Army has determined that the Warrior is the best option available to meet its operational requirement, which requires an unmanned aircraft system dedicated to direct operational control by its field commanders. The Army believes that the Predator A is operationally and technically mismatched with its needs. The Army intends to use Warrior to enhance overall force capability by teaming it with other of its assets such as the Apache helicopter, using common ground control equipment to network with other unmanned aircraft systems, and allowing soldiers in the field to operate the aircraft. The Army expects Warrior to have several key technical features that the Army believes will better meet its operational needs, including a heavy fuel engine that uses a single Army-wide fuel, an automatic take-off and landing system to improve safety, a faster tactical common data link for interoperability with other Army assets, an ethernet for quicker communications within the Warrior system, greater carrying capacity for weapons, and avionics with enhanced reliability. The Army estimates that each Warrior aircraft and associated basic equipment will cost about $4.4 million, less than the aircraft and similar equipment for the Predator A at $4.8 million. While the Predator B system is expected to meet or exceed some of the Warrior's capabilities, it is estimated to cost $9 million for similar equipment.

DTIC

Drone Vehicles; Pilotless Aircraft

20060021842 Missouri Univ., Columbia, MO USA

A Preliminary Study of Ultrasonic Detection of Cracks Through Thick Composite Doublers

Neal, Steven P; Cepel, Raina; Palmer, Jr, Donald D; Feb 2006; 13 pp.; In English

Contract(s)/Grant(s): FA8650-04-C-5704; Proj-2865

Report No.(s): AD-A447954; No Copyright; Avail.: CASI: A03, Hardcopy

Composite doublers have been introduced as a repair method to take a substantial portion of the structural load away from the region around a crack in aluminum aircraft structures. The subsequent use of nondestructive evaluation methods to test the quality of the composite doubler bond and to characterize the crack beneath the doubler is described. In particular, the use of scanning ultrasound methods is evaluated along with appropriate analysis methods to characterize the crack.

DTIC

Aircraft; Cracks; Reinforcing Materials; Sound Detecting and Ranging; Ultrasonic Flaw Detection; Ultrasonics

20060021845 Lockheed Martin Corp., Baltimore, MD USA

Shipboard Organic UAV Operations

Wenderoth, Joe; Sidewater, Elliott; Jun 23, 2005; 41 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447957; No Copyright; Avail.: CASI: A03, Hardcopy

1. BACKGROUND: * Littoral initiatives in Fleet Battle Experiment-Juliet * Industry led collaborative execution. 2. UAV Integration: * Evolution of shipboard organic UAV concepts * Organic UAV development initiatives * Shipboard

implementation. 3. UAV Ops Results: * Shipboard operation * Conclusions/recommendations.
DTIC
Military Operations; Pilotless Aircraft; Remotely Piloted Vehicles

20060021862 Naval Postgraduate School, Monterey, CA USA
Airborne Radar Search for Diesel Submarines (ARSDS)
Pilnick, Steven E; Landa, Jose; Jun 23, 2005; 35 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447985; No Copyright; Avail.: CASI: A03, Hardcopy

Aircraft search to catch diesel submarines on the sea surface or with masts exposed above the sea surface has been an anti-submarine warfare tactic for more than half a century. However, rather than analysis, operational judgment has been used to guess at good search tactics such as how large an area can one aircraft cover effectively. In this research, a detection rate model is developed to analyze the effectiveness of an airborne radar search for a diesel submarine assumed to be intermittently operating with periscopes or masts exposed above the sea surface. The analysis obtains cumulative probability of detection vs. time based on the radar manufacturer's performance data, user inputs for aircraft search area size, search speed, and search altitude, and submarine periscope or mast exposure profile. The model can use given periscope radar cross section data, or roughly calculate radar cross section given assumptions about exposed periscope height above the sea-surface and sea-state conditions. Submarine evasion due to radar counter-detection is also modeled.
DTIC
Airborne Radar; Search Radar; Submarines

20060021870 Defence Science and Technology Organisation, Victoria, Australia
Organophosphate and Amine Contamination of Cockpit Air in the Hawk, F-111 and C-130 Aircraft
Hanhela, P J; Kibby, J; DeNola, G; Mazurek, W; Oct 2005; 31 pp.; In English
Report No.(s): AD-A448000; DSTO-RR-0303; No Copyright; Avail.: CASI: A03, Hardcopy

A survey of cockpit air contamination by organophosphates and amines in the Hawk, F-111 and Hercules C-130 aircraft was undertaken. The air contamination occurred via the engine bleed air supply. The source of tricresyl phosphates, pheny-alpha-naphthylamine and diotyldiphenylamine was jet engine oil while hydraulic fluids are suspected of contributing to the presence of trialkyl phosphates. The concentrations of all contaminants measured were generally very low. Tricresyl phosphate concentrations were below 4 mug/m3 with two exceptions (21.7, 49 mug/m3, Hawk) compared to the maximum permissible concentrations (100 mug/m3). Ground engine starts, at high power, gave rise to the highest concentrations. Phenyl-alpha-naphthylamine and dioctyldiphenylamine concentrations were also very low (\h0.06 mug/m3) in the Hercules C-130 and the absence of exposure limits for the two compounds reflects on their apparent low toxicity.
DTIC
Air Pollution; Amines; C-130 Aircraft; Cockpits; Contamination; F-111 Aircraft; Fighter Aircraft; Organic Phosphorus Compounds; Transport Aircraft

20060021900 Whitney, Bradley and Brown, Vienna, VA USA
Manpower Requirements Determination for New Systems: Broad Area Maritime Surveillance (BAMS) Unmanned Aerial Vehicle (UAV)
Hegland, David K; Mulholland, William M; Jun 23, 2005; 63 pp.; In English; Original contains color illustrations
Report No.(s): AD-A448085; No Copyright; Avail.: CASI: A04, Hardcopy

BAMS UAV Concept of Operations: (1) High altitude (above 40K), Long dwell (over 24 hrs), autonomous; (2) Persistent, forward deployed ISR (5 x 24/7/365). TRADITIONAL APPROACH: (1) Current system upgrade or new system replacing old; (2) Specific vehicle/system; (3) ROC/POE; (4) Workload metrics available (maintenance & human systems); (5) Predominately military (active & reserve) manning. BAMS UAV: (1) Completely new system -- no baseline comparison system; (2) Vehicle not selected; (3) No ROC/POE; (4) No maintenance or HS data.
DTIC
Drone Vehicles; Manpower; Oceans; Pilotless Aircraft; Reconnaissance; Surveillance

20060021961 Grumman Aircraft Engineering Corp., Bethpage, NY USA
Fully-Stressed Design of Airframe Redundant Structures
Dwyer, W; Rosenbaum, J; Shulman, M; Pardo, H; Oct 1968; 28 pp.; In English
Report No.(s): AD-A446711; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA446711; Avail.: CASI: A03, Hard-copy

This paper presents a description of two automated, fully stressed design procedures for airframe redundant structures along with wing box beam examples. One of the methods is a variation of the other; both are based upon the displacement method and are essentially digital computer adaptations of a traditional optimization technique. Using the simpler, 'average stress' method, one analyzes a structure that has been idealized as a system of discrete elements and then resizes the members of the structure based upon the average stresses occurring in each member, together with some failure criteria. It has been found that in applying this method to aircraft wings, the final structure resulting from many iterations sometimes exhibits discontinuities in material distributions that are sufficiently severe to be unacceptable to stress analysts for use in design. This effect is evident in the accompanying examples. Even in such cases, however, useful results for rough work (e.g., preliminary design) may be obtained by cutting off the iteration procedure after approximately three cycles. The alternative approach is based upon 'nodal stresses' in the manner of the force method rather than average element stresses, and it converges to reasonably smooth material distributions. It has the disadvantage, however, of requiring additional programming for its implementation. Consequently, thus far it has been applied only to wing-type structures. Both procedures have been in use recently at Grumman on various preliminary designs.
DTIC
Aircraft Structures; Airframes; Box Beams; Displacement; Optimization; Redundancy; Redundant Components; Stress Analysis; Structural Engineering; Wings

20060022529 Congressional Budget Office, Washington, DC USA
CBO Testimony: Modernizing Tactical Aircraft
Jehn, Christopher; Mar 10, 1999; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447666; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447666; Avail.: CASI: A03, Hard-copy

Fighter aircraft in the Air Force, Navy, and Marine Corps represent a major part of U.S. combat capability. But maintaining that capability will be costly. DoD plans to purchase more than 3,700 new tactical fighters over the next 27 years at a combined cost of almost $340 billion, according to Congressional Budget Office (CBO) estimates. My testimony today addresses the following questions: (1) How balanced are DoD's tactical aviation plans? Do they purchase aircraft in sufficient quantities to halt fleet aging? Will DoD need to reduce the numbers of its tactical fighter forces or to equip them less generously in the future? (2) Are the plans affordable, or does it appear that funds for tactical aviation could squeeze out other priority programs absent significantly increased funding for purchases? (3) How do this year's budget submission out-year assumptions and estimates affect the execution of the tactical aviation modernization plan? (4) Do DoD's plans for tactical fighters and other strike assets represent the best and most efficient resource mix? (5) What is your assessment of the attempts to reconcile the differences in cost estimating methodologies that have led CBO and DoD to reach different conclusions about overall affordability of the tactical aviation modernization program? My statement focuses on the costs and affordability of DoD's current plans and whether those plans, if carried out, would buy enough aircraft to meet requirements and keep fleets from growing older. However, CBO has not attempted to construct or analyze alternatives to those plans.
DTIC
Cost Analysis; Cost Estimates; Priorities

20060022530 Congressional Budget Office, Washington, DC USA
CBO Testimony: Modernizing Tactical Aircraft
Williams, Cindy; Jun 27, 1996; 35 pp.; In English
Report No.(s): AD-A447664; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447664; Avail.: CASI: A03, Hard-copy

The Department of Defense (DoD) plans to acquire three new tactical fighter and attack aircraft for the Air Force, the Navy, and the Marine Corps. The three planes are the F-22 fighter for the Air Force, the F/A-18E/F for the Navy, and the Joint Strike Fighter (JSF)--a multipurpose plane being developed for all three services. DoD expects all three planes to be more capable than the planes they replace. However, they will also be expensive. DoD plans to buy a total of about 4,400 planes of those three types. CBO estimates that the total cost to develop and acquire them amounts to more than $350 billion, even without factoring in inflation. Over the 1997-2001 period, DoD says, about $34 billion (in 1997 dollars; about $36 billion in current dollars) will be spent for those planes, representing about 9 percent of DoD's planned acquisition spending for the period. In my testimony, after providing background on these fighter and attack aircraft, I would like to discuss four main points that have emerged from our analysis: (1) U.S. fighter fleets outmatch the fighter fleets of any potential adversary; and (2) DoD plans to purchase enough tactical aircraft to meet the inventory requirements of its fleets through 2020; but (3) The plans assume that tactical aircraft will operate for long periods, and as a result U.S. tactical aircraft fleets will reach

unprecedented ages; and finally, but not least, (4) DoD's planned aircraft purchases for fighter fleets may prove to be unaffordable. I will wrap up my remarks with a brief discussion of several policy alternatives that the Congress may wish to consider in addressing those last two points.
DTIC
Cost Analysis; Defense Program; Estimates; Inventories; Policies; Attack Aircraft

20060022541 NASA Langley Research Center, Hampton, VA, USA
Development of a Low-Cost Sub-Scale Aircraft for Flight Research: The FASER Project
Owens, Donald B.; Cox, David E.; Morelli, Eugene A.; [2006]; 11 pp.; In English; 25th AIAA Aerodynamic Measurement Technology and Ground Testing Conference, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 457280.02.07.07
Report No.(s): AIAA Paper 2006-3306; No Copyright; Avail.: CASI: A03, Hardcopy

An inexpensive unmanned sub-scale aircraft was developed to conduct frequent flight test experiments for research and demonstration of advanced dynamic modeling and control design concepts. This paper describes the aircraft, flight systems, flight operations, and data compatibility including details of some practical problems encountered and the solutions found. The aircraft, named Free-flying Aircraft for Sub-scale Experimental Research, or FASER, was outfitted with high-quality instrumentation to measure aircraft inputs and states, as well as vehicle health parameters. Flight data are stored onboard, but can also be telemetered to a ground station in real time for analysis. Commercial-off-the-shelf hardware and software were used as often as possible. The flight computer is based on the PC104 platform, and runs xPC-Target software. Extensive wind tunnel testing was conducted with the same aircraft used for flight testing, and a six degree-of-freedom simulation with nonlinear aerodynamics was developed to support flight tests. Flight tests to date have been conducted to mature the flight operations, validate the instrumentation, and check the flight data for kinematic consistency. Data compatibility analysis showed that the flight data are accurate and consistent after corrections are made for estimated systematic instrumentation errors.
Author
Flight Tests; Low Cost; Pilotless Aircraft; Wind Tunnel Tests; Control Systems Design; Research Aircraft

20060022548 NASA Dryden Flight Research Center, Edwards, CA, USA
The F-15B Lifting Insulating Foam Trajectory (LIFT) Flight Test
Corda, Stephen; Whiteman, Donald; Tseng, Ting; Machin, Ricardo; June 28, 2006; 58 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2006-213674; H-2627; No Copyright; Avail.: CASI: A04, Hardcopy

A series of flight tests has been performed to assess the structural survivability of space shuttle external tank debris, known as divots, in a real flight environment. The NASA F-15B research test bed aircraft carried the Aerodynamic Flight Test Fixture configured with a shuttle foam divot ejection system. The divots were released in flight at subsonic and supersonic test conditions matching points on the shuttle ascent trajectory. Very high-speed digital video cameras recorded the divot trajectories. The objectives of the flight test were to determine the structural survivability of the divots in a real flight environment, assess the aerodynamic stability of the divots, and provide divot trajectory data for comparison with debris transport models. A total of 10 flights to Mach 2 were completed, resulting in 36 successful shuttle foam divot ejections. Highspeed video was obtained at 2,000 pictures per second for all of the divot ejections. The divots that were cleanly ejected remained structurally intact. The conical frustum-shaped divots tended to aerodynamically trim in both the subsonic and supersonic free-stream flow.
Author
Flight Tests; Foams; Insulation; F-15 Aircraft; Computational Fluid Dynamics; Ascent Trajectories; Space Shuttles; Debris; External Tanks

20060022604 NASA Ames Research Center, Moffett Field, CA, USA
A Program to Improve the Triangulated Surface Mesh Quality Along Aircraft Component Intersections
Cliff, Susan E.; May 2005; 44 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 21-982-10-20
Report No.(s): NASA/TM-2005-213455; A-0513777; No Copyright; Avail.: CASI: A03, Hardcopy

A computer program has been developed for improving the quality of unstructured triangulated surface meshes in the

vicinity of component intersections. The method relies solely on point removal and edge swapping for improving the triangulations. It can be applied to any lifting surface component such as a wing, canard or horizontal tail component intersected with a fuselage, or it can be applied to a pylon that is intersected with a wing, fuselage or nacelle. The lifting surfaces or pylon are assumed to be aligned in the axial direction with closed trailing edges. The method currently maintains salient edges only at leading and trailing edges of the wing or pylon component. This method should work well for any shape of fuselage that is free of salient edges at the intersection. The method has been successfully demonstrated on a total of 125 different test cases that include both blunt and sharp wing leading edges. The code is targeted for use in the automated environment of numerical optimization where geometric perturbations to individual components can be critical to the aerodynamic performance of a vehicle. Histograms of triangle aspect ratios are reported to assess the quality of the triangles attached to the intersection curves before and after application of the program. Large improvements to the quality of the triangulations were obtained for the 125 test cases; the quality was sufficient for use with an automated tetrahedral mesh generation program that is used as part of an aerodynamic shape optimization method.
Author
Aerodynamic Configurations; Triangulation; Computer Programs; Body-Wing Configurations; Canard Configurations; Horizontal Tail Surfaces; Trailing Edges; Sharp Leading Edges; Nacelles; Shape Optimization; Intersections

07
AIRCRAFT PROPULSION AND POWER

Includes primary propulsion systems and related systems and components, e.g., gas turbine engines, compressors, and fuel systems; and onboard auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power; 28 Propellants and Fuels; and 44 Energy Production and Conversion.

20060021605 NASA Glenn Research Center, Cleveland, OH, USA
Advances in Engine Test Capabilities at the NASA Glenn Research Center's Propulsion Systems Laboratory
Pachlhofer, Peter M.; Panek, Joseph W.; Dicki, Dennis J.; Piendl, Barry R.; Lizanich, Paul J.; Klann, Gary A.; May 2006; 16 pp.; In English; ASME Turbo Expo 2006, 8-11 May 2006, Barcelona, Spain; Original contains color illustrations
Contract(s)/Grant(s): WBS 726-01-03-00; DA Proj. 1L1-61102-AF-20
Report No.(s): NASA/TM-2006-214087; ARL-06-431; GT2006-90121; E-15424; Copyright; Avail.: CASI: A03, Hardcopy

The Propulsion Systems Laboratory at the National Aeronautics and Space Administration (NASA) Glenn Research Center is one of the premier U.S. facilities for research on advanced aeropropulsion systems. The facility can simulate a wide range of altitude and Mach number conditions while supplying the aeropropulsion system with all the support services necessary to operate at those conditions. Test data are recorded on a combination of steady-state and highspeed data-acquisition systems. Recently a number of upgrades were made to the facility to meet demanding new requirements for the latest aeropropulsion concepts and to improve operational efficiency. Improvements were made to data-acquisition systems, facility and engine-control systems, test-condition simulation systems, video capture and display capabilities, and personnel training procedures. This paper discusses the facility s capabilities, recent upgrades, and planned future improvements.
Author
Aircraft Engines; Engine Tests; Support Systems; Propulsion System Configurations; Data Acquisition; Engine Control

20060021606 NASA Glenn Research Center, Cleveland, OH, USA
Engineering Analysis Studies for Preliminary Design of Lightweight Cryogenic Hydrogen Tanks in UAV Applications
Sullivan, Roy M.; Palko, Joseph L.; Tornabene, Robert T.; Bednarcyk, Brett A.; Powers, Lynn M.; Mital, Subodh K.; Smith, Lizalyn M.; Wang, Xiao-Yen J.; Hunter, James E.; May 2006; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 489-02-07-03
Report No.(s): NASA/TP-2006-214094; E-15431; Copyright; Avail.: CASI: A03, Hardcopy

A series of engineering analysis studies were conducted to investigate the potential application of nanoclay-enhanced graphite/epoxy composites and polymer cross-linked silica aerogels in cryogenic hydrogen storage tank designs. This assessment focused on the application of these materials in spherical tank designs for unmanned aeronautic vehicles with mission durations of 14 days. Two cryogenic hydrogen tank design concepts were considered: a vacuum-jacketed design and a sandwiched construction with an aerogel insulating core. Analyses included thermal and structural analyses of the tank designs as well as an analysis of hydrogen diffusion to specify the material permeability requirements. The analyses also provided material property targets for the continued development of cross-linked aerogels and nanoclay-enhanced

graphite/epoxy composites for cryogenic storage tank applications. The results reveal that a sandwiched construction with an aerogel core is not a viable design solution for a 14-day mission. A vacuum-jacketed design approach was shown to be far superior to an aerogel. Aerogel insulation may be feasible for shorter duration missions. The results also reveal that the application of nanoclay-enhanced graphite/epoxy should be limited to the construction of outer tanks in a vacuum-jacketed design, since a graphite/epoxy inner tank does not provide a significant weight savings over aluminum and since the ability of nanoclay-enhanced graphite/epoxy to limit hydrogen permeation is still in question.
Author
Aerogels; Graphite-Epoxy Composites; Structural Analysis; Permeability; Cryogenics; Storage Tanks; Spherical Tanks

20060021969 NASA Glenn Research Center, Cleveland, OH, USA
Performance Assessment of a Large Scale Pulsejet- Driven Ejector System
Paxson, Daniel E.; Litke, Paul J.; Schauer, Frederick R.; Bradley, Royce P.; Hoke, John L.; May 2006; 20 pp.; In English; 44th Aerospace Sciences Meeting and Exhibit, 9-12 Jan. 2006, Reno, NV, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 489-02-07-03
Report No.(s): NASA/TM-2006-214224; E-15472; AIAA Paper 2006-1021; Copyright; Avail.: CASI: A03, Hardcopy

Unsteady thrust augmentation was measured on a large scale driver/ejector system. A 72 in. long, 6.5 in. diameter, 100 lb(sub f) pulsejet was tested with a series of straight, cylindrical ejectors of varying length, and diameter. A tapered ejector configuration of varying length was also tested. The objectives of the testing were to determine the dimensions of the ejectors which maximize thrust augmentation, and to compare the dimensions and augmentation levels so obtained with those of other, similarly maximized, but smaller scale systems on which much of the recent unsteady ejector thrust augmentation studies have been performed. An augmentation level of 1.71 was achieved with the cylindrical ejector configuration and 1.81 with the tapered ejector configuration. These levels are consistent with, but slightly lower than the highest levels achieved with the smaller systems. The ejector diameter yielding maximum augmentation was 2.46 times the diameter of the pulsejet. This ratio closely matches those of the small scale experiments. For the straight ejector, the length yielding maximum augmentation was 10 times the diameter of the pulsejet. This was also nearly the same as the small scale experiments. Testing procedures are described, as are the parametric variations in ejector geometry. Results are discussed in terms of their implications for general scaling of pulsed thrust ejector systems
Author
Pulsejet Engines; Thrust Augmentation; Ejectors; Augmentation

20060022557 NASA Langley Research Center, Hampton, VA, USA
Design Enhancements of the Two-Dimensional, Dual Throat Fluidic Thrust Vectoring Nozzle Concept
Flamm, Jeffrey D.; Deere, Karen A.; Mason, Mary L.; Berrier, Bobby L.; Johnson, Stuart K.; January 2006; 27 pp.; In English; Third AIAA Flow Control Conference, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.10.07.05
Report No.(s): AIAA Paper 2006-3701; No Copyright; Avail.: CASI: A03, Hardcopy

A Dual Throat Nozzle fluidic thrust vectoring technique that achieves higher thrust-vectoring efficiencies than other fluidic techniques, without sacrificing thrust efficiency has been developed at NASA Langley Research Center. The nozzle concept was designed with the aid of the structured-grid, Reynolds-averaged Navier-Stokes computational fluidic dynamics code PAB3D. This new concept combines the thrust efficiency of sonic-plane skewing with increased thrust-vectoring efficiencies obtained by maximizing pressure differentials in a separated cavity located downstream of the nozzle throat. By injecting secondary flow asymmetrically at the upstream minimum area, a new aerodynamic minimum area is formed downstream of the geometric minimum and the sonic line is skewed, thus vectoring the exhaust flow. The nozzle was tested in the NASA Langley Research Center Jet Exit Test Facility. Internal nozzle performance characteristics were defined for nozzle pressure ratios up to 10, with a range of secondary injection flow rates up to 10 percent of the primary flow rate. Most of the data included in this paper shows the effect of secondary injection rate at a nozzle pressure ratio of 4. The effects of modifying cavity divergence angle, convergence angle and cavity shape on internal nozzle performance were investigated, as were effects of injection geometry, hole or slot. In agreement with computationally predicted data, experimental data verified that decreasing cavity divergence angle had a negative impact and increasing cavity convergence angle had a positive impact on thrust vector angle and thrust efficiency. A curved cavity apex provided improved thrust ratios at some injection rates. However, overall nozzle performance suffered with no secondary injection. Injection holes were more efficient than the

injection slot over the range of injection rates, but the slot generated larger thrust vector angles for injection rates less than 4 percent of the primary flow rate.
Author
Thrust Vector Control; Fluidics; Injection; Secondary Flow; Secondary Injection; Pressure Ratio

20060022730 Pittsburgh Univ., Pittsburgh, PA, USA
Impermeable thin AI2O3 overlay for TBC Protection from Sulfate and Vanadate Attack in Gas Turbines. (Final Report, September 1, 2001-August 31, 2005.)
Mao, S. X.; Oct. 2005; 28 pp.; In English
Report No.(s): DE2006-877397; No Copyright; Avail.: Department of Energy Information Bridge

In order to improve the hot corrosion resistance of conventional YSZ TBC system, a dense and continues overlay of Al2O3 coating of about 0.1 - 25 m m thick was deposited on the surface of TBC by EB-PVD, high velocity oxy-fuel (HVOF) spray and composite-sol-gel (CSG) techniques. Hot corrosion tests were carried out on the TBC with and without Al2O3 coating in molten salts mixtures (Na2SO4 + 5%V2O5) at 950C for 10h. The microstructures of TBC and overlay before and after exposure were examined by means of scanning electron microscopy (SEM), energy-dispersive X-ray spectrometer (EDX), X-ray diffraction (XRD) and secondary ion mass spectrometry (SIMS). In order to investigate the effect of Al2O3 overlay on degradation and spalling of the TBC, indentation test has been employed to study spallation behaviors of YSZ coating with and without Al2O3 overlay. It has been found that TBC will react with V2O5 to form YVO4 in hot corrosion tests. A substantial amount of M-phase of ZrO2 was formed due to the leaching of Y2O3 from YSZ. During hot corrosion test, there were no significant interactions between overlay Al2O3 coating and molten salts. After exposure, the alumina coating, especially produced by HVOF, was still very dense and cover the surface of YSZ, although they had been translated to - a Al2O3 from original - g Al2O3. As a result, Al2O3 overlay coating decreased the penetration of salts into the YSZ and prevented the YSZ from the attack by molten salts containing vanadium. Accordingly, only a few M-phase was formed in YSZ TBC, compared with TBC without overlay coating. The penetration of salts into alumina coating was thought to be through microcracks formed in overlay Al2O3 coating and at the interface between alumina and zriconia due to the presence of tensile stress in the alumina coating. Al2O3 overlay acted as a barrier against the infiltration of the molten salt into the YSZ coating during exposure, thus significantly reduced the amount of M-phase of ZrO2 in YSZ coating. However, a thick Al2O3 overlay was harmful for TBC by increasing compressive stress which causes crack and spalling of YSZ coating. As a result, a dense and thin Al2O3 overlay is critical for simultaneously preventing YSZ from hot corrosion and spalling.
NTIS
Corrosion Resistance; Gas Turbines; Protection; Protective Coatings; Sulfates; Vanadates

08
AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities, piloting, flight controls, and autopilots. For related information see also 05 Aircraft Design, Testing and Performance; and 06 Avionics and Aircraft Instrumentation.

20060021973 NASA Glenn Research Center, Cleveland, OH, USA
Demonstration of an Ice Contamination Effects Flight Training Device
Ratvasky, Thomas P.; Ranaudo, Richard J.; Blankenship, Kurt S.; Lee, Sam; May 2006; 24 pp.; In English; 44th Aerospace Sciences Meeting and Exhibit, 9-12 Jan. 2006, Reno, NV, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 866-02-07-03-02
Report No.(s): NASA/TM-2006-214233; AIAA Paper 2006-0677; E-15480; Copyright; Avail.: CASI: A03, Hardcopy

The development of a piloted flight simulator called the Ice Contamination Effects Flight Training Device (ICEFTD) was recently completed. This device demonstrates the ability to accurately represent an iced airplane s flight characteristics and is utilized to train pilots in recognizing and recovering from aircraft handling anomalies that result from airframe ice formations. The ICEFTD was demonstrated at three recent short courses hosted by the University of Tennessee Space Institute. It was also demonstrated to a group of pilots at the National Test Pilot School. In total, eighty-four pilots and flight test engineers from industry and the regulatory community spent approximately one hour each in the ICEFTD to get a ‘hands on’ lesson of an iced airplane s reduced performance and handling qualities. Additionally, pilot cues of impending upsets and recovery techniques were demonstrated. The purpose of this training was to help pilots understand how ice contamination affects aircraft handling so they may apply that knowledge to the operations of other aircraft undergoing testing and development. Participant feedback on the ICEFTD was very positive. Pilots stated that the simulation was very valuable,

applicable to their occupations, and provided a safe way to explore the flight envelope. Feedback collected at each demonstration was also helpful to define additional improvements to the ICEFTD; many of which were then implemented in subsequent demonstrations
Author
Aircraft Icing; Flight Simulators; Flight Training; Contamination; Flight Tests; Flight Characteristics; Controllability

20060022130 NASA Langley Research Center, Hampton, VA, USA
A High-Throughput Processor for Flight Control Research Using Small UAVs
Klenke, Robert H.; Sleeman, W. C., IV; Motter, Mark A.; 2006; 9 pp.; In English; 25th AIAA Aerodynamic Measurement Technology and Ground Testing Conference, 5-8 Jun. 2006, San Francisco, CA, USA
Contract(s)/Grant(s): 581-02-08-07
Report No.(s): AIAA Paper 2006-3308; Copyright; Avail.: CASI: A02, Hardcopy

There are numerous autopilot systems that are commercially available for small (\h100 lbs) UAVs. However, they all share several key disadvantages for conducting aerodynamic research, chief amongst which is the fact that most utilize older, slower, 8- or 16-bit microcontroller technologies. This paper describes the development and testing of a flight control system (FCS) for small UAV s based on a modern, high throughput, embedded processor. In addition, this FCS platform contains user-configurable hardware resources in the form of a Field Programmable Gate Array (FPGA) that can be used to implement custom, application-specific hardware. This hardware can be used to off-load routine tasks such as sensor data collection, from the FCS processor thereby further increasing the computational throughput of the system.
Author
Embedding; Flight Control; Flight Management Systems; Automatic Pilots; Data Acquisition; Field-Programmable Gate Arrays; Aerodynamics

20060022131 NASA Langley Research Center, Hampton, VA, USA
Adaptive Failure Compensation for Aircraft Tracking Control Using Engine Differential Based Model
Liu, Yu; Tang, Xidong; Tao, Gang; Joshi, Suresh M.; 2006; 6 pp.; In English; 2006 American Control Conference, 14-16 Jun. 2006, Mineapolis, MN, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NCC1-02006; 280-07-07; No Copyright; Avail.: CASI: A02, Hardcopy

An aircraft model that incorporates independently adjustable engine throttles and ailerons is employed to develop an adaptive control scheme in the presence of actuator failures. This model captures the key features of aircraft flight dynamics when in the engine differential mode. Based on this model an adaptive feedback control scheme for asymptotic state tracking is developed and applied to a transport aircraft model in the presence of two types of failures during operation, rudder failure and aileron failure. Simulation results are presented to demonstrate the adaptive failure compensation scheme.
Author
Adaptive Control; Failure; Feedback Control; Aerodynamics; Aircraft Control; Actuators

20060022136 NASA Langley Research Center, Hampton, VA, USA
AirSTAR: A UAV Platform for Flight Dynamics and Control System Testing
Jordan, Thomas L.; Foster, John V.; Bailey, Roger M.; Belcastro, Christine M.; 2006; 15 pp.; In English; 25th AIAA Aerodynamic Measurement Technology and Ground Testing Conference, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 280-02-07-07
Report No.(s): AIAA Paper 2006-3307; No Copyright; Avail.: CASI: A03, Hardcopy

As part of the NASA Aviation Safety Program at Langley Research Center, a dynamically scaled unmanned aerial vehicle (UAV) and associated ground based control system are being developed to investigate dynamics modeling and control of large transport vehicles in upset conditions. The UAV is a 5.5% (seven foot wingspan), twin turbine, generic transport aircraft with a sophisticated instrumentation and telemetry package. A ground based, real-time control system is located inside an operations vehicle for the research pilot and associated support personnel. The telemetry system supports over 70 channels of data plus video for the downlink and 30 channels for the control uplink. Data rates are in excess of 200 Hz. Dynamic scaling of the UAV, which includes dimensional, weight, inertial, actuation, and control system scaling, is required so that the sub-scale vehicle will realistically simulate the flight characteristics of the full-scale aircraft. This testbed will be utilized to validate modeling methods, flight dynamics characteristics, and control system designs for large transport aircraft, with the end

goal being the development of technologies to reduce the fatal accident rate due to loss-of-control.
Author
Aircraft Safety; Ground Based Control; Pilotless Aircraft; Flight Characteristics; Flight Safety; Aerodynamics

20060022147 NASA Langley Research Center, Hampton, VA, USA
Bias Momentum Sizing for Hovering Dual-Spin Platforms
Lim, Kyong B.; Shin, Jong-Yeob; Moerder, Daniel D.; May 2006; 53 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 581-02-08
Report No.(s): NASA/TP-2006-214317; L-19257; No Copyright; Avail.: CASI: A04, Hardcopy

An atmospheric flight vehicle in hover is typically controlled by varying its thrust vector. Achieving both levitation and attitude control with the propulsion system places considerable demands on it for agility and precision, particularly if the vehicle is statically unstable, or nearly so. These demands can be relaxed by introducing an appropriately sized angular momentum bias aligned with the vehicle's yaw axis, thus providing an additional margin of attitude stability about the roll and pitch axes. This paper describes a methodical approach for trading off angular momentum bias level needed with desired levels of vehicle response due to the design disturbance environment given a vehicle's physical parameters. It also describes several simplifications that provide a more physical and intuitive understanding of dual-spin dynamics for hovering atmospheric vehicles. This approach also mitigates the need for control torques and inadvertent actuator saturation difficulties in trying to stabilize a vehicle via control torques produced by unsteady aerodynamics, thrust vectoring, and unsteady throttling. Simulation results, based on a subscale laboratory test flying platform, demonstrate significant improvements in the attitude control robustness of the vehicle with respect to both wind disturbances and off-center of gravity payload changes during flight.
Author
Attitude Control; Attitude Stability; Hovering; Momentum; Thrust Vector Control; Aerodynamic Stability

20060022544 NASA Langley Research Center, Hampton, VA, USA
The Next Generation of High-Speed Dynamic Stability Wind Tunnel Testing (Invited)
Tomek, Deborah M.; Sewall, William G.; Mason, Stan E.; Szchur, Bill W. A.; [2006]; 19 pp.; In English; 25th AIAA Aerodynamic Measurement Technology and Ground Testing Conference, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 23-064-10-34
Report No.(s): AIAA Paper 2006-3148; Copyright; Avail.: CASI: A03, Hardcopy

Throughout industry, accurate measurement and modeling of dynamic derivative data at high-speed conditions has been an ongoing challenge. The expansion of flight envelopes and non-conventional vehicle design has greatly increased the demand for accurate prediction and modeling of vehicle dynamic behavior. With these issues in mind, NASA Langley Research Center (LaRC) embarked on the development and shakedown of a high-speed dynamic stability test technique that addresses the longstanding problem of accurately measuring dynamic derivatives outside the low-speed regime. The new test technique was built upon legacy technology, replacing an antiquated forced oscillation system, and greatly expanding the capabilities beyond classic forced oscillation testing at both low and high speeds. The modern system is capable of providing a snapshot of dynamic behavior over a periodic cycle for varying frequencies, not just a damping derivative term at a single frequency.
Author
Wind Tunnel Tests; Dynamic Stability; Transonic Wind Tunnels; Aerodynamic Configurations

20060022552 NASA Langley Research Center, Hampton, VA, USA
Simulation to Flight Test for a UAV Controls Testbed
Motter, Mark A.; Logan, Michael J.; French, Michael L.; Guerreiro, Nelson M.; 2006; 5 pp.; In English; 25th AIAA Aerodynamic Measurement Technology and Ground Testing Conference, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 561581.02.08.07
Report No.(s): AIAA Paper 2006-3305; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA Flying Controls Testbed (FLiC) is a relatively small and inexpensive unmanned aerial vehicle developed specifically to test highly experimental flight control approaches. The most recent version of the FLiC is configured with 16

independent aileron segments, supports the implementation of C-coded experimental controllers, and is capable of fully autonomous flight from takeoff roll to landing, including flight test maneuvers. The test vehicle is basically a modified Army target drone, AN/FQM-117B, developed as part of a collaboration between the Aviation Applied Technology Directorate (AATD) at Fort Eustis, Virginia and NASA Langley Research Center. Several vehicles have been constructed and collectively have flown over 600 successful test flights, including a fully autonomous demonstration at the Association of Unmanned Vehicle Systems International (AUVSI) UAV Demo 2005. Simulations based on wind tunnel data are being used to further develop advanced controllers for implementation and flight test.
Author
Controllers; Flight Tests; Pilotless Aircraft; Computerized Simulation; Wind Tunnel Tests; Test Stands

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operations see *03 Air Transportation and Safety*. For astronautical facilities see *14 Ground Support Systems and Facilities (Space)*.

20060021860 Science Applications International Corp., San Diego, CA USA
Modeling Runway Damage and Repair using the Simulation of Linear Interdiction, Cratering, and Repair (SLICR) Model
Todd, William; Harvey, Allen; Lewis, Frank; Jun 23, 2005; 40 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447981; No Copyright; Avail.: CASI: A03, Hardcopy

Presentation on modeling runway damage and repair using the Simulation of Linear Interdiction, Cratering, and Repair (SLICR) model. Contents of the briefing include: Problem description; Runway closing heuristic/Statistical model; SLICR model description and methodology: probability of closing runway-target flexibility, attack strategies; time required for runway repair; missile defense; Model Demonstration.
DTIC
Cratering; Damage; Damage Assessment; Ordnance; Runways; Simulation

12
ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20*. For extraterrestrial exploration see *91 Lunar and Planetary Science and Exploration*.

20060021582 AI Solutions, Inc., Lanham, MD, USA, AI Solutions, Inc., Lanham, MD, USA
Iterative Magnetometer Calibration
[2006]; 3 pp.; In English; AAS/AIAA Astrodynamics Specialists Conference, 21-24 Aug. 2006, Keystone, CO, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

This paper presents an iterative method for three-axis magnetometer (TAM) calibration that makes use of three existing utilities recently incorporated into the attitude ground support system used at NASA's Goddard Space Flight Center. The method combines attitude-independent and attitude-dependent calibration algorithms with a new spinning spacecraft Kalman filter to solve for biases, scale factors, nonorthogonal corrections to the alignment, and the orthogonal sensor alignment. The method is particularly well-suited to spin-stabilized spacecraft, but may also be useful for three-axis stabilized missions given sufficient data to provide observability.
Author
Magnetometers; Calibrating; Ground Support Systems; Attitude (Inclination); Kalman Filters; Attitude Control; Algorithms; Alignment

20060021733 Mitre Corp., Colorado Springs, CO USA

A Common Foundation of Information and Analytical Capability for AFSPC Decision Making

Lehmkuhl, Lee; Przybysz, James; Jun 23, 2005; 20 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447836; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447836; Avail.: CASI: A03, Hardcopy

Presentation on developing a common foundation of information and analytic capability for AFSPC(Air Force Space Command) decision making. Overview: Space Superiority; Need for architecturally-based analysis; OV(Operation View)-1; Define Team/Process; Incorporating ABR in IPP; Analysis methodology; Way-ahead/Summary.

DTIC

Decision Making; Management Planning; Space Missions

20060021734 Teledyne Brown Engineering, Huntsville, AL USA

Implementation of Space-Based Radar (SBR) Functionality in the Advanced Warfighting Simulation (AWARS)

Phend, Andy; Fann, Joseph D; Glasgow, Steve; Franssen, Jeff; Elliott, Steven R; Jun 23, 2005; 29 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447838; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447838; Avail.: CASI: A03, Hardcopy

Presentation on the implementation of space-based radar functionality in the Advanced Warfighting Simulation (AWARS).

DTIC

Simulation; Space Based Radar; Synthetic Aperture Radar; Systems Engineering

20060021878 Georgia Inst. of Tech., Atlanta, GA USA

Modeling of Unilateral Contact Conditions in Aerospace Systems

Bauchau, Olivier A; Ferri, Aldo A; Dec 31, 2005; 174 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0176

Report No.(s): AD-A448024; No Copyright; Avail.: CASI: A08, Hardcopy

Multibody dynamics analysis is a powerful tool for the comprehensive simulation of the dynamic response of various flexible aerospace systems that are important to the Air Force. Systems of arbitrary topology and complexity can be readily modeled; they include both aircraft and spacecraft. In present formulations, the joints connecting the various flexible bodies are not modeled per se. Rather, the effect of joints, i.e. the constraints they impose on the behavior of the entire system are modeled through a set of kinematic constraints; the piece of hardware that actually constitutes the joint is not modeled.

DTIC

Aerospace Systems; Dynamic Response

20060022125 NASA Langley Research Center, Hampton, VA, USA

Aeroheating Analysis for the Mars Reconnaissance Orbiter with Comparison to Flight Data

Liechty, Derek S.; 2006; 8 pp.; In English; 9th AIAA/ASME Joint Thermophysics and Heat Transfer Conference, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 23-892-10-01

Report No.(s): AIAA Paper 2006-3890; No Copyright; Avail.: CASI: A02, Hardcopy

The aeroheating environment of the Mars Reconnaissance Orbiter (MRO) has been analyzed using the Direct Simulation Monte Carlo and free-molecular techniques. The results of these analyses were used to develop an aeroheating database to be used for the pre-flight planning and the in-flight operations support for the aerobraking phase of the MRO mission. The aeroheating predictions calculated for the MRO include the heat transfer coefficient (C(H)) over a range of angles-of-attack, side-slip angles, and number densities. The effects of flow chemistry were also investigated. Flight heat flux data deduced from surface temperature sensors have been compared to pre-flight predictions and agree favorably.

Author

Aerodynamic Heating; Mars Reconnaissance Orbiter; Free Molecular Flow; Monte Carlo Method; Aerobraking; Flight Plans; Heat Transfer Coefficients

13
ASTRODYNAMICS

Includes powered and free flight trajectories; orbital and launching dynamics.

20060021963 Goodyear Aerospace Corp., Akron, OH USA
Development and Evaluation of Coating for an Unfurlable Re-Entry Vehicle
Jan 1960; 20 pp.; In English
Report No.(s): AD-A447680; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447680; Avail.: CASI: A03, Hard-copy

The advance of missile and astronautic technology to the present state-of-the-art has introduced new and unique fields for the engineer. To assure the most efficient use of the limited volume and payload capabilities of the present generation booster in establishing orbital flight for large vehicles, a flexible or expandable structure which can be unfurled when orbital trajectory is attained offers the greatest present potential. This type of structure can be completely assembled on the ground, packaged to a minimum symmetrical size compatible with the booster last stage diameter, easily transported to the launch site, installed on the missile, and automatically deployed into the space environment upon achieving the desired orbital position. This flexible structure approach developed by GAC entails the use of either internal pressure or mechanically stabilized fabric. Once orbital flight has been accomplished, the next step requires that instrumentation and personnel must be returned from active space vehicles. Using the expandable structure approach, a lightweight vehicle can be adapted to this purpose and the temperature encountered by this re-entering vehicle can be limited to the order of 1500 degrees. In general, the basic structure of the re-entry vehicle would be a woven material. Since this material is porous to some degree, a coating is required which will act as a gas barrier when the structure is pressure stabilized, or as an airflow barrier when the skin is mechanically stabilized. This coating must withstand aerodynamic shear forces, maintain its integrity at 1500 degrees F, and be extremely flexible prior to exposure to maximum temperature. In addition, the coating must be compatible with the basic material of the cloth and the cloth construction. Presented in this paper is a discussion of the approach to the development of such a coating, a description of the tests and test procedure used to evaluate the coating, and some of the test results.
DTIC
Coating; Coatings; Reentry Vehicles

15
LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing and Performance*; and *20 Spacecraft Propulsion and Power*.

20060021952 Bell Aerosystems Co., Tucson, AZ USA
Structural Analysis Practices for Large Scale Systems
Mallett, Robert H; Braun, Frederick W; Hunter, Donald T; Oct 1968; 51 pp.; In English
Report No.(s): AD-A447749; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447749; Avail.: CASI: A04, Hard-copy

Structural analysis practices that contribute to the effective analysis of large scale systems are described. The technical approach is via the matrix displacement method of structural analysis based upon finite element idealization. The context is a detailed thermal and mechanical stress analysis of the stacked Apollo Block II Spacecraft Lunar Module Adapter (SLA) and Service Module (SM). This structure is modeled in terms of 34 substructures which lead to an approximate total of 5000 finite elements and 15,000 displacement degrees-of-freedom. This refinement accounts for the complex variations in overall geometry, sizing dimensions, materials, thermal loading, mechanical loading, and boundary conditions. Embodied in the physical model are truss, frame, shear panel, triangular thin shell, quadrilateral thin shell, and triangular prism finite elements. The division into substructures of moderate size is put forward as a key to effective technical management of the stress analysis process.
DTIC
Procedures; Stress Analysis; Structural Analysis

20060021967 NASA Johnson Space Center, Houston, TX, USA

An Evolvable Approach to Launch Vehicles for Exploration

Cheuvront, David L.; Nguyen, Tri X.; [2005]; 1 pp.; In English; Continuing the Voyage of Discovery: First Space Exploration Conference, 2-4 Feb. 2005, Orlando, FL, USA; No Copyright; Avail.: Other Sources; Abstract Only

This paper presents ideas that may be used individually or in combination to mitigate high costs for separate developments of new crew and heavy-lift cargo launch vehicles, while providing the foundation for a highly reliable and evolvable approach to exploration. Consideration is given to reclassification of cargo for launch purposes into high value versus low value categories, rather than the presently-defined crew versus cargo categories. Objectives for the reclassification are to reduce the gap between payload mass requirements for crew and cargo payloads to better allow closure on a single moderately-sized common core vehicle to reduce development cost, achieve an economical balance between launch frequency and payload mass, and to improve total mission reliability and safety, as compared a light-weight crew vehicle and heavy cargo lift approach. Concepts to reduce design and flight qualification costs for a common core vehicle with derivatives are presented. Appropriate types and mass of cargo for each class of vehicle are identified. Utilization of existing infrastructure and flight hardware is considered to reduce costs and build on proven capabilities. The approach enables low-risk incorporation of international and commercial launch of relatively low-cost, easily replaceable assets as a means to evolve toward longer-duration and more distant missions. Benefits are identified for ground idrastructure, personnel, training, logistics, spares, and system evolution. Technology needs are compared with needs for other aspects of exploration. Technology development phasing, demonstration, and reliability growth opportunities are considered. Flexibility to adapt to future technologies such as advanced in-space propulsion is contrasted with an approach of sizing the cargo launch vehicle based on today's in-space propellants.

Author

Cargo; Payloads; Technology Utilization; Heavy Lift Launch Vehicles; Space Exploration

20060022141 NASA Johnson Space Center, Houston, TX, USA

Crew Exploration Vehicle Environmental Control and Life Support Development Status

Lewis, John F.; 2006; 5 pp.; In English; ICES, 16-19 Jul. 2006, Norfolk, VA, USA; Original contains color illustrations

Report No.(s): SAE-2006-01-2011; Copyright; Avail.: Other Sources

The Crew Exploration Vehicle (CEV) is the first crew transport vehicle to be developed by the National Aeronautics and Space Administration (NASA) in the last thirty years. The CEV is being developed to transport the crew safely from the Earth to the Moon and back again. The mission is similar to the Apollo approach with expanded capabilities and extended durations to support a larger crew and a longer mission. The Environmental Control and Life Support (ECLS) system, which includes the life support and thermal control systems, will have to meet these new requirements, taking advantage of the latest in component development where necessary and applicable.

Author

Life Support Systems; Crew Exploration Vehicle; Environmental Control; Transport Vehicles; Space Missions

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information see also *04 Aircraft Communications and Navigation*; and *32 Communications and Radar*.

20060022068 NASA Glenn Research Center, Cleveland, OH, USA

Autonomous Navigation Error Propagation Assessment for Lunar Surface Mobility Applications

Welch, Bryan W.; Connolly, Joseph W.; May 2006; 16 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 432-07-04-03-01

Report No.(s): NASA/TM-2006-214354; E-15629; No Copyright; Avail.: CASI: A03, Hardcopy

The NASA Vision for Space Exploration is focused on the return of astronauts to the Moon. While navigation systems have already been proven in the Apollo missions to the moon, the current exploration campaign will involve more extensive and extended missions requiring new concepts for lunar navigation. In this document, the results of an autonomous navigation error propagation assessment are provided. The analysis is intended to be the baseline error propagation analysis for which Earth-based and Lunar-based radiometric data are added to compare these different architecture schemes, and quantify the

benefits of an integrated approach, in how they can handle lunar surface mobility applications when near the Lunar South pole or on the Lunar Farside.
Author
Autonomous Navigation; Error Analysis; Lunar Surface; Space Exploration

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance; 39 Structural Mechanics*; and *16 Space Transportation and Safety*.

20060022133 NASA Langley Research Center, Hampton, VA, USA
A Mesh Refinement Study on the Impact Response of a Shuttle Leading-Edge Panel Finite Element Simulation
Fasanella, Edwin L.; Jackson, Karen E.; Lyle, Karen H.; Spellman, Regina L.; 2006; 15 pp.; In English; 9th International LS-DYNA Users Conference, 4-6 Jun. 2006, Dearborn, MI, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

A study was performed to examine the influence of varying mesh density on an LS-DYNA simulation of a rectangular-shaped foam projectile impacting the space shuttle leading edge Panel 6. The shuttle leading-edge panels are fabricated of reinforced carbon-carbon (RCC) material. During the study, nine cases were executed with all possible combinations of coarse, baseline, and fine meshes of the foam and panel. For each simulation, the same material properties and impact conditions were specified and only the mesh density was varied. In the baseline model, the shell elements representing the RCC panel are approximately 0.2-in. on edge, whereas the foam elements are about 0.5-in. on edge. The element nominal edge-length for the baseline panel was halved to create a fine panel (0.1-in. edge length) mesh and doubled to create a coarse panel (0.4-in. edge length) mesh. In addition, the element nominal edge-length of the baseline foam projectile was halved (0.25-in. edge length) to create a fine foam mesh and doubled (1.0-in. edge length) to create a coarse foam mesh. The initial impact velocity of the foam was 775 ft/s. The simulations were executed in LS-DYNA for 6 ms of simulation time. Contour plots of resultant panel displacement and effective stress in the foam were compared at four discrete time intervals. Also, time-history responses of internal and kinetic energy of the panel, kinetic and hourglass energy of the foam, and resultant contact force were plotted to determine the influence of mesh density.
Author
Carbon-Carbon Composites; Space Shuttles; Projectiles; Panels; Leading Edges; Impact Velocity; Simulation; Foams

20060022142 Army Research Lab., Hampton, VA, USA
Test and Analysis Correlation of High Speed Impacts of Ice Cylinders
Fasanella, Edwin L.; Boitnott, Richard L.; Kellas, Sotiris; [2006]; 12 pp.; In English; 9th International LS-DYNA Users Conference, 4-6 Jun. 2006, Dearborn, MI, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 376-70-30-07; Copyright; Avail.: CASI: A03, Hardcopy

During the space shuttle return-to-flight preparations following the Columbia accident, finite element models were needed that could predict the threshold of critical damage to the orbiter s wing leading edge from ice debris impacts. Hence, an experimental program was initiated to provide crushing data from impacted ice for use in dynamic finite element material models. A high-speed drop tower was configured to capture force time-histories of ice cylinders for impacts up to approximately 100 ft/s. At low velocity, the force-time history depended heavily on the internal crystalline structure of the ice. However, for velocities of 100 ft/s and above, the ice fractured on impact, behaved more like a fluid, and the subsequent force-time history curves were much less dependent on the internal crystalline structure.
Author
Finite Element Method; Leading Edges; High Speed; Damage; Space Shuttles; Wings; Debris

20060022160 NASA Marshall Space Flight Center, Huntsville, AL, USA
Genesis Reentry Observations and Data Analysis
Suggs, R. M.; Swift, W. R.; November 2005; 40 pp.; In English; Original contains color illustrations
Report No.(s): NASA/TM-2005-214192; M-1154; Copyright; Avail.: CASI: A03, Hardcopy

The Genesis spacecraft reentry represented a unique opportunity to observe a ‘calibrated meteor’ from northern Nevada.

Knowing its speed, mass, composition, and precise trajectory made it a good subject to test some of the algorithms used to determine meteoroid mass from observed brightness. It was also a good test of an inexpensive set of cameras that could be deployed to observe future shuttle reentries. The utility of consumer-grade video cameras was evident during the STS-107 accident investigation, and the Genesis reentry gave us the opportunity to specify and test commercially available cameras that could be used during future reentries. This Technical Memorandum describes the video observations and their analysis, compares the results with a simple photometric model, describes the forward scatter radar experiment, and lists lessons learned from the expedition and implications for the Stardust reentry in January 2006 as well as future shuttle reentries.
Author
Spacecraft Reentry; Stardust Mission; Meteoroids; Brightness; Cameras; Space Transportation System; Photometry

20060022542 NASA Langley Research Center, Hampton, VA, USA
Displacements of Metallic Thermal Protection System Panels During Reentry
Daryabeigi, Kamran; Blosser, Max L.; Wurster, Kathryn E.; [2006]; 8 pp.; In English; 9th AIAA/ASME Joint Thermophysics and Heat Transfer Conference, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 599489.02.07.07; No Copyright; Avail.: CASI: A02, Hardcopy

Bowing of metallic thermal protection systems for reentry of a previously proposed single-stage-to-orbit reusable launch vehicle was studied. The outer layer of current metallic thermal protection system concepts typically consists of a honeycomb panel made of a high temperature nickel alloy. During portions of reentry when the thermal protection system is exposed to rapidly varying heating rates, a significant temperature gradient develops across the honeycomb panel thickness, resulting in bowing of the honeycomb panel. The deformations of the honeycomb panel increase the roughness of the outer mold line of the vehicle, which could possibly result in premature boundary layer transition, resulting in significantly higher downstream heating rates. The aerothermal loads and parameters for three locations on the centerline of the windward side of this vehicle were calculated using an engineering code. The transient temperature distributions through a metallic thermal protection system were obtained using 1-D finite volume thermal analysis, and the resulting displacements of the thermal protection system were calculated. The maximum deflection of the thermal protection system throughout the reentry trajectory was 6.4 mm. The maximum ratio of deflection to boundary layer thickness was 0.032. Based on previously developed distributed roughness correlations, it was concluded that these defections will not result in tripping the hypersonic boundary layer.
Author
Displacement; Panels; Reentry Trajectories; Thermal Protection; Metal Surfaces; X-33 Reusable Launch Vehicle; Mathematical Models

20060022549 NASA Langley Research Center, Hampton, VA, USA
Boundary Layer Transition Results From STS-114
Berry, Scott A.; Horvath, Thomas J.; Cassady, Amy M.; Kirk, Benjamin S.; Wang, K. C.; Hyatt, Andrew J.; [2006]; 13 pp.; In English; 9th AIAA/ASME Joint Thermophysics and Heat Transfer Conference, 5-8 Jun. 2006, San Francisco, CA, USA
Contract(s)/Grant(s): WBS 732759.07.05
Report No.(s): AIAA Paper 2006-2922; No Copyright; Avail.: CASI: A03, Hardcopy

The tool for predicting the onset of boundary layer transition from damage to and/or repair of the thermal protection system developed in support of Shuttle Return to Flight is compared to the STS-114 flight results. The Boundary Layer Transition (BLT) Tool is part of a suite of tools that analyze the aerothermodynamic environment of the local thermal protection system to allow informed disposition of damage for making recommendations to fly as is or to repair. Using mission specific trajectory information and details of each damage site or repair, the expected time of transition onset is predicted to help determine the proper aerothermodynamic environment to use in the subsequent thermal and stress analysis of the local structure. The boundary layer transition criteria utilized for the tool was developed from ground-based measurements to account for the effect of both protuberances and cavities and has been calibrated against flight data. Computed local boundary layer edge conditions provided the means to correlate the experimental results and then to extrapolate to flight. During STS-114, the BLT Tool was utilized and was part of the decision making process to perform an extravehicular activity to remove the large gap fillers. The role of the BLT Tool during this mission, along with the supporting information that was acquired for the on-orbit analysis, is reviewed. Once the large gap fillers were removed, all remaining damage sites were cleared for reentry as is. Post-flight analysis of the transition onset time revealed excellent agreement with BLT Tool predictions.
Author
Aerothermodynamics; Boundary Layer Transition; Space Transportation System Flights; Thermal Protection; Discovery (Orbiter)

20060022566 NASA Ames Research Center, Moffett Field, CA, USA

Design Methods and Practices for Fault Prevention and Management in Spacecraft

Tumer, Irem Y.; [2005]; 16 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: Other Sources; Abstract Only

Integrated Systems Health Management (ISHM) is intended to become a critical capability for all space, lunar and planetary exploration vehicles and systems at NASA. Monitoring and managing the health state of diverse components, subsystems, and systems is a difficult task that will become more challenging when implemented for long-term, evolving deployments. A key technical challenge will be to ensure that the ISHM technologies are reliable, effective, and low cost, resulting in turn in safe, reliable, and affordable missions. To ensure safety and reliability, ISHM functionality, decisions and knowledge have to be incorporated into the product lifecycle as early as possible, and ISHM must be considered as an essential element of models developed and used in various stages during system design. During early stage design, many decisions and tasks are still open, including sensor and measurement point selection, modeling and model-checking, diagnosis, signature and data fusion schemes, presenting the best opportunity to catch and prevent potential failures and anomalies in a cost-effective way. Using appropriate formal methods during early design, the design teams can systematically explore risks without committing to design decisions too early. However, the nature of ISHM knowledge and data is detailed, relying on high-fidelity, detailed models, whereas the earlier stages of the product lifecycle utilize low-fidelity, high-level models of systems and their functionality. We currently lack the tools and processes necessary for integrating ISHM into the vehicle system/subsystem design. As a result, most existing ISHM-like technologies are retrofits that were done after the system design was completed. It is very expensive, and sometimes futile, to retrofit a system health management capability into existing systems. Last-minute retrofits result in unreliable systems, ineffective solutions, and excessive costs (e.g., Space Shuttle TPS monitoring which was considered only after 110 flights and the Columbia disaster). High false alarm or false negative rates due to substandard implementations hurt the credibility of the ISHM discipline. This paper presents an overview of the current state of ISHM design,and a review of formal design methods to make recommendations about possible approaches to enable the ISHM capabilities to be designed-in at the system-level, from the very beginning of the vehicle design process.

Author

Systems Engineering; Fault Detection; System Failures; Systems Health Monitoring; Component Reliability; Reliability Engineering; Failure; Management Systems

20
SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 15 Launch Vehicles and Launch Operations*, and *44 Energy Production and Conversion*.

20060021948 NASA Glenn Research Center, Cleveland, OH, USA

Liquid Hydrogen Sensor Considerations for Space Exploration

Moran, Matthew E.; May 2006; 13 pp.; In English; Sensors Applications Symposium 2006, 7-9 Feb. 2006, Houston, TX, USA; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 746-01-02-03

Report No.(s): NASA/TM-2006-214264; E-15549; No Copyright; Avail.: CASI: A03, Hardcopy

The on-orbit management of liquid hydrogen planned for the return to the moon will introduce new considerations not encountered in previous missions. This paper identifies critical liquid hydrogen sensing needs from the perspective of reliable on-orbit cryogenic fluid management, and contrasts the fundamental differences in fluid and thermodynamic behavior for ground-based versus on-orbit conditions. Opportunities for advanced sensor development and implementation are explored in the context of critical Exploration Architecture operations such as on-orbit storage, docking, and trans-lunar injection burn. Key sensing needs relative to these operations are also examined, including: liquid/vapor detection, thermodynamic condition monitoring, mass gauging, and leak detection. Finally, operational aspects of an integrated system health management approach are discussed to highlight the potential impact on mission success.

Author

Liquid Hydrogen; Sensors; Space Exploration; Cryogenics

20060022052 BAFCO, Inc., Warminster, PA, USA

Making a Reliable Actuator Faster and More Affordable

Spinoff 2005; 2005, pp. 98-99; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Before any rocket is allowed to fly and be used for a manned mission, it is first test-fired on a static test stand to verify its flight readiness. NASA s Stennis Space Center provides testing of Space Shuttle Main Engines, rocket propulsion systems, and related components with several test facilities. It has been NASA s test-launch site since 1961. The testing stations age with time and repeated use; and with aging comes maintenance; and with maintenance comes expense. NASA has been seeking ways to lower the cost of maintaining the stations, and has aided in the development of an improved reliable linear actuator that arrives onsite quickly and costs less money than other actuators. In general terms, a linear actuator is a servomechanism that supplies a measured amount of energy for the operation of another mechanical system. Accuracy, reliability, and speed of the actuator are critical to performance of the entire system, and these actuators are critical components of the engine test stands. Partnership An actuator was developed as part of a Dual-Use Cooperative Agreement between BAFCO, Inc., of Warminister, Pennsylvania, and Stennis. BAFCO identified four suppliers that manufactured actuator components that met the rigorous testing standards imposed by the Space Agency and then modified these components for application on the rocket test stands. In partnership with BAFCO, the existing commercial products size and weight were reworked, reducing cost and delivery time. Previously, these parts would cost between $20,000 and $22,000, but with the new process, they now run between $11,000 and $13,000, a substantial savings, considering NASA has already purchased over 120 of the units. Delivery time of the cost-saving actuators has also been cut from over 20 to 22 weeks to within 8 to 10 weeks. The redesigned actuator is commercially available, and the company is successfully supplying them to customers other than NASA.

Derived from text

Actuators; Engine Tests; Cost Reduction; Rocket Engines; Servomechanisms; Reliability

20060022139 Minnesota Univ., Minneapolis, MN, USA

Validation of Multi-Dimensional Stirling Engine Design Codes: Measurements in the 90-Degree Turn Test Section

Simon, Terrence W.; Adolfson, David; May 2006; 216 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAG3-2482; WBS 972-30-01

Report No.(s): NASA/CR-2006-214131; E-15465; No Copyright; Avail.: CASI: A10, Hardcopy

The work to be presented herein was motivated largely by a desire to improve the understanding of oscillatory fluid mechanics inside a Stirling engine. To this end, a CFD project was undertaken at Cleveland State University with the goal of accurately predicting the fluid dynamics within an engine or engine component. Along with the CFD efforts, a code validation project was undertaken at the University of Minnesota. The material covered herein consists of four main parts. In section 1, an experimental investigation of a small aspect ratio impinging jet is discussed. Included in this discussion is a description of the test facilities and instrumentation. A presentation of the collected data is given and comments are made. Next, in section 2, a parallel experimental investigation is presented in which the same geometry as that of section 1 is used, but the flow conditions are changed from steady unidirectional flow to sinusoidally oscillating flow. In section Two, collected data are presented and comments are made. In section 3, a comparison is made between the results of sections 1 and 2, namely, sinusoidally oscillating flow results are compared to steady, unidirectional flow results from the same geometry. Finally, in section 4, a comparison is made between experimentally collected data (the main subject of this work) and CFD generated results. Furthermore, in appendix A, an introductory description of the primary measurement tool used in the experimental process the hot wire anemometer is given for the unfamiliar. The anemometer calibration procedure is described in appendix B. A portfolio of data reduction and data processing codes is provided in appendix C and lastly, a DVD and a roadmap of its contents is provided in an appendix D. 1.0 Unidirectional Flow Investigations 1.1 Introduction This unidirectional experimental program was undertaken to complement an oscillatory flow investigation conducted at the University of Minnesota. The oscillatory investigation is discussed thoroughly in section 2. We defer the description of the motivation behind these experiments until the introduction of section 2. The work that is discussed in this thesis began (chronologically) with oscillatory flow visualization experiments. It was decided that it would be valuable and important to investigate the flow under unidirectional conditions in the same geometry as that of the oscillatory experiments. The thought was that the unidirectional case would be less complicated to model with a CFD program (a moving boundary would be replaced with a steady state boundary condition). Thus, a series of unidirectional experiments were carried out to capture the important features of the flow within the test section. The purpose of these experiments was to provide a data set for comparison to CFD generated velocity fields. Hot-wire anemometry data were taken and flow visualization was conducted as a standard for code

validation. The flow geometry was simple, such that it could be easily gridded in a CFD program. However, the geometry provided separation and transition zones, shear layers and recirculation zones. These characteristics made the flow complex and challenging for CFD computation. We comment that the order of experiments that produced this report is as follows: experimental flow visualization under oscillatory flow conditions was carried out; this was followed by unidirectional flow visualization and hot wire anemometry; finally, oscillatory hot wire anemometry was conducted. We present the results out of chronological order for the following reason: the unidirectional results are easier
Author
Computational Fluid Dynamics; Engine Design; Flow Visualization; Oscillating Flow; Oscillations; Stirling Engines; Steady Flow

23
CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 25 through 29*. For astrochemistry see category *90 Astrophysics*.

20060021620 National Toxicology Program, Research Triangle Park, NC, USA
NTP Technical Report on the Toxicology and Carcinogenesis Studies of Benzophenone (CAS No. 119-61-9) in F344/N Rats and B6C3F1 Mice (Feed Studies)
Feb. 2006; 272 pp.; In English
Report No.(s): PB2006-111481; NIH/PUB-06-4469; NTP-TR-533; No Copyright; Avail.: CASI: A12, Hardcopy

Benzophenone is used as a photoinitiator, a fragrance enhancer, an ultraviolet curing agent, and occasionally as a flavor ingredient; it is also used in the manufacture of insecticides, agricultural chemicals, and hypnotics, antihistamines, and other pharmaceuticals; and it is used as an additive in plastics, coatings, and adhesive formulations. Benzophenone was nominated for study by the National Institute of Environmental Health Sciences based on its potential for occupational and consumer exposure and the lack of long-term toxicity data. Male and female F344/N rats and B6C3F1 mice were exposed to benzophenone (greater than 99% pure) in feed for 2 years. Genetic toxicology studies were conducted in Salmonella typhimurium, mouse bone marrow cells, and mouse peripheral blood erythrocytes. Results of 14-week toxicity studies in F344/N rats and B6C3F1 mice were reported earlier (NTP, 2000).
NTIS
Benzene; Carcinogens; Ketones; Mice; Rats; Toxicology

20060021622 Geological Survey, Reston, VA USA
Reconnaissance Geochemical and Mineralogical Study of the Stanley Uranium District, Custer County, Central Idaho
Van Gosen, B. S.; Hammarstrom, J. M.; Eppinger, R. G.; Briggs, P. H.; Crock, J. G.; January 2005; 66 pp.; In English
Report No.(s): PB2006-112040; USGS-SIR-2005-5264; No Copyright; Avail.: National Technical Information Service (NTIS)

The inactive Stanley uranium district, the first commercial uranium district in Idaho, covers an approximately 10 mi.area located a few miles east of Stanley and north of the Salmon River in central Idaho. The district contains at least 27 uranium deposits that were prospected and mined during the late 1950s and early 1960s. This report provides multi-element analyses of the samples collected in the Stanley uranium district and data from mineralogical studies of the uranium-bearing rocks.
NTIS
Deposits; Geochemistry; Idaho; Mineralogy; Reconnaissance; Uranium

20060021641 Colorado School of Mines, Golden, CO USA
Welding Over Paint Primer
Johnson, Kevin S; Liu, Stephen; Olson, David L; May 1, 1998; 241 pp.; In English
Report No.(s): AD-A447591; NSRP-0524; CSM-MT-CWJCR-098-010; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447591; Avail.: CASI: A11, Hardcopy

When welding is performed over primer-coated steels such as in the shipbuilding and offshore structures fabrication industry, significant amounts of hydrogen and other gases, e.g., CO and Zn(v) are generated as the welding arc causes the primer to decompose. If entrapped in the weld pool, the hydrogen and other gases will produce porosity. Since hydrogen has been shown to compose most of the gas generated in a fluxcored arc weld over a primer-coated steel, it is also the most detrimental. According to the hydrogen-oxygen and }hydrogen-fluorine equilibrium considerations, an increase in the partial

pressure of oxygen or fluorine could decrease the partial pressure of hydrogen within the welding arc. Consequently, a welding consumable that contains chemical ingredients of high oxygen and fluorine potential would be capable of minimizing hydrogen pick-up in the weld pool.
DTIC
Paints; Welding

20060021730 Air Force Research Lab., Hanscom AFB, MA USA
Collisional Stabilization and Thermal Dissociation of Highly Vibrationally Excited C9H12(+) Ions from the Reaction O2(+) + C9H12 yields O2 + C9H12(+)
Fernandez, Abel I; Viggiano, A A; Miller, Thomas M; Williams, S; Dotan, I; Seeley, J V; Troe, J; Jan 2004; 9 pp.; In English
Contract(s)/Grant(s): FA8655-03-1-3034; Proj-2303
Report No.(s): AD-A447833; AFRL-VS-HA-TR-2005-1182; No Copyright; ONLINE:
http://hdl.handle.net/100.2/ADA447833; Avail.: CASI: A02, Hardcopy

Highly vibrationally excited n-propylbenzene cations, C9H12(+*), were prepared by the charge transfer reaction O2(+) + C9H12 yields O2 + C9H12(+*) in a turbulent ion flow tube. The subsequent competition between fragmentation of C9H12(+*) into C7H7(+) + C2H5 and stabilization in collisions with N2 was studied at temperatures in the range 423-603 K and at pressures between 15 and 200 Torr. Most of the C7H7(+) is the aromatic benzylium isomer, while the fraction of the minor species, seven-membered-ring tropylium, increases with T, from 5 to 20%. Minor fragments are C6H6(+), C7H8(+), and C8H9(+). Energy-transfer step sizes \hDELTA-EPSILON\g for collisional deactivation are obtained by combining the stabilization versus fragmentation ratios measured as a function of pressure in this study with fragmentation rates from the literature. The values are compared with related information for other excited molecular ions and are similar to those of their neutral analogues. At the highest temperatures, C9H12(+) was also observed to pyrozyze after collisional stabilization. Employing unimolecular rate theory, the derived rate constants for thermal dissociation of C9H12(+) are related to values derived from the specific rate constants k(E,J) for fragmentation. Good agreement is found between measured and predicted pyrolysis rate constants. This allows us to confirm the dissociation energy of C9H12(+) into C7H7(+) (benzylium) and C2H5 as 166.9 (+/-2.2) kJ/mol (at 0 K).
DTIC
Cations; Charge Transfer; Dissociation; Ions; Oxygen; Thermal Dissociation

20060021798 Innovative Scientific Solutions, Inc., Dayton, OH USA
Applications of Laser Diagnostics
Goss, Larry P; Mar 2005; 708 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-00-C-2068; Proj-3048
Report No.(s): AD-A447848; ISSI-2068 FINAL; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes the results of experimental and numerical investigations on gas-turbine combustion and fuel processes. The purpose of this program is the advancement of the state-of-the-art in laser diagnostics, modeling and simulations, propulsion sciences, advanced propulsion concepts, current and next-generation gas-turbine-engine components, and high-impact revolutionary technologies for airbreathing propulsion systems. The objectives of this research program include: Development, evaluation, and utilization of state-of-the-art-laser diagnostic techniques and analytical simulations and models in the study of combustion, fuel, turbine, and compressor processes that are important to current and future propulsion systems. Performance of fundamental experiments that will advance the understanding of critical combustion and fuel processes. Identification and development of the critical-technology needs of pulsed-detonation engines. Performance of advanced-cycle-aero and aerospace-propulsion-system studies that will result in high-impact revolutionary technologies. Evaluation of potential commercial applications of advanced technologies developed during the program.
DTIC
Combustion; Diagnosis; Laser Induced Fluorescence; Lasers; Models; Simulation

20060021802 Lawrence Livermore National Lab., Livermore, CA USA
Extinction and Autoignition of n-Heptane in Counterflow Configuration
Seiser, R; Pitsch, H; Seshadri, K; Pitz, W J; Curran, H J; Aug 4, 2000; 10 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0259; W-7405-ENG-48
Report No.(s): AD-A447894; No Copyright; Avail.: CASI: A02, Hardcopy

A study was performed to elucidate the mechanisms of extinction and autoignition of n-heptane in strained laminar flows

under non-premixed conditions. A previously developed detailed mechanism made up of 2540 reversible elementary reactions among 556 species was the starting point for the study. The detailed mechanism was previously used to calculate ignition delay times in homogeneous reactors, and concentration histories of a number of species in plug-flow and jet-stirred reactors. An intermediate mechanism made up of 1282 reversible elementary reactions among 282 species and a short mechanism made up of 770 reversible elementary reactions among 159 species were assembled from this detailed mechanism. Ignition delay times in an isochoric homogeneous reactor calculated using the intermediate and the short mechanism were found to agree well with those calculated using the detailed mechanism. The intermediate and the short mechanism were used to calculate extinction and autoignition of n-heptane in strained laminar flows. Steady laminar flow of two counterflowing streams toward a stagnation plane was considered. One stream, made up of prevaporized n-heptane and nitrogen, was injected from the fuel boundary, and the other stream, made up of air and nitrogen, was injected from the oxidizer boundary. Critical conditions of extinction and autoignition given by the strain rate, temperature, and concentrations of the reactants at the boundaries were calculated. The results were found to agree well with experiments. Sensitivity analysis was carried out to evaluate the influence of various elementary reactions on autoignition. At all values of the strain rate investigated here, high-temperature chemical processes were found to control autoignition.
DTIC
Counterflow; Extinction; Heptanes; Ignition; Spontaneous Combustion

20060021869 Florida Univ., Gainesville, FL USA
Platinum Acetylide Materials for Optical Limiting
Schanze, Kirk S; May 10, 2006; 13 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0127
Report No.(s): AD-A447999; No Copyright; Avail.: CASI: A03, Hardcopy

This project explored linear and non-linear optical structure-property relationships for Pt-acetylide oligomers and polymers. These materials show promise for application in laser protection via the reverse saturable absorption (RSA) mechanism. This basic science program had the following primary objectives: 1) Chemical synthesis and purification of new pi-conjugated Pt-acetylide oligomers and polymers. 2) Characterization of the ground and excited state properties of the new materials, with emphasis placed on measurement of parameters that are important to reverse saturable absorption. These parameters include ground state absorption spectra, singlet-triplet intersystem crossing yields, triplet excited state cross sections, and triplet excited state quenching via triplet-triplet annihilation. 3) Evaluate new materials for application as reverse saturable absorbers. The project also explored other key issues, including tuning the spectral region where the ground state and triplet excited states absorb for series of structurally-related Pt- acetylide materials, development of materials that are liquids at ambient temperature, and study of triplet excited state quenching in the solid state.
DTIC
Nonlinear Optics; Organometallic Compounds; Platinum; Polymers

20060021880 Maryland Univ., College Park, MD USA
Versatile Element for Free-Space Dividing and Redirecting Neutral Atom Clouds
Arakelyan, I V; Chattrapiban, N; Mitra, S; Hill, W T; Nov 28, 2005; 5 pp.; In English
Contract(s)/Grant(s): DAAD190110695; PHY0426696
Report No.(s): AD-A448030; No Copyright; Avail.: CASI: A01, Hardcopy

We introduce a tunnel lock that can be exploited to divide, delay and alter the direction of traveling clouds of cold atoms. This versatile free-space element is implemented by crossing two atom tunnels formed by low intensity, blue-detuned dark-hollow (Bessel mode) laser beams. We show that clouds of cold 87Rb atoms initially moving within one tunnel can be transferred to the other by gating the intensities of the two tunnels - a tunnel lock - with an efficiency limited by the overlap volume. The element also can be used to divide a single cloud into smaller clouds each having a distinct momentum.
DTIC
Atoms; Neutral Atoms; Photochemical Reactions; Rubidium

20060021972 Sandia National Labs., Albuquerque, NM USA
Assembly and Actuation of Nanomaterials Using Active Biomolecules
Bachand, G. D.; Bunker, B. C.; Rivera, S. B.; Boal, A. K.; Bachand, M.; Nov. 2005; 56 pp.; In English
Report No.(s): DE2006-875628; SAND2005-6524; No Copyright; Avail.: National Technical Information Service (NTIS)

The formation and functions of living materials and organisms are fundamentally different from those of synthetic

materials and devices. Synthetic materials tend to have static structures, and are not capable of adapting to the functional needs of changing environments. In contrast, living systems utilize energy to create, heal, reconfigure, and dismantle materials in a dynamic, non-equilibrium fashion. The overall goal of the project was to organize and reconfigure functional assemblies of nanoparticles using strategies that mimic those found in living systems. Active assembly of nanostructures was studied using active biomolecules to drive the organization and assembly of nanocomposite materials. In this system, kinesin motor proteins and microtubules were used to direct the transport and interactions of nanoparticles at synthetic interfaces. In addition, the kinesin/microtubule transport system was used to actively assemble nanocomposite materials capable of storing significant elastic energy. Novel biophysical measurement tools were also developed for measuring the collective force generated by kinesin motor proteins, which will provide insight on the mechanical constraints of active assembly processes. Responsive reconfiguration of nanostructures was studied in terms of using active biomolecules to mediate the optical properties of quantum dot (QD) arrays through modulation of inter-particle spacing and associated energy transfer interaction. Design rules for kinesin-based transport of a wide range of nanoscale cargo (e.g., nanocrystal quantum dots, micron-sized polymer spheres) were developed. Three-dimensional microtubule organizing centers were assembled in which the polar orientation of the microtubules was controlled by a multi-staged assembly process. Overall, a number of enabling technologies were developed over the course of this project, and will drive the exploitation of energy-driven processes to regulate the assembly, disassembly, and dynamic reorganization of nanomaterials.
NTIS
Biochemistry; Nanoparticles; Energy Transfer

20060021977 Sandia National Labs., Albuquerque, NM USA
Micro Flame-Based Detector Suite for Universal Gas Sensing
Manginell, R.; Washburn, C.; Moorman, M.; Hamilton, T.; Oct. 2005; 40 pp.; In English
Report No.(s): DE2006-875633; SAND2005-6236; No Copyright; Avail.: National Technical Information Service (NTIS)

A microflame-based detector suit has been developed for sensing of a broad range of chemical analytes. This detector combines calorimetry, flame ionization detection (FID), nitrogenphosphorous detection (NPD) and flame photometric detection (FPD) modes into one convenient platform based on a microcombustor. The microcombustor consists in a micromachined microhotplate with a catalyst or low-work function material added to its surface. For the NPD mode a low work function material selectively ionizes chemical analytes; for all other modes a supported catalyst such as platinum/alumina is used. The microcombustor design permits rapid, efficient heating of the deposited film at low power. To perform calorimetric detection of analytes, the change in power required to maintain the resistive microhotplate heater at a constant temperature is measured. For FID and NPD modes, electrodes are placed around the microcombustor flame zone and an electrometer circuit measures the production of ions. For FPD, the flame zone is optically interrogated to search for light emission indicative of deexcitation of flame-produced analyte compounds. The calorimetric and FID modes respond generally to all hydrocarbons, while sulfur compounds only alarm in the calorimetric mode, providing speciation. The NPD mode provides 10,000:1 selectivity of nitrogen and phosphorous compounds over hydrocarbons. The FPD can distinguish between sulfur and phosphorous compounds. Importantly all detection modes can be established on one convenient microcombustor platform, in fact the calorimetric, FID and FPD modes can be achieved simultaneously on only one microcombustor. Therefore, it is possible to make a very universal chemical detector array with as little as two microcombustor elements. A demonstration of the performance of the microcombustor in each of the detection modes is provided herein.
NTIS
Flames; Gas Analysis; Gas Detectors

20060021982 Sandia National Labs., Albuquerque, NM USA
LDRD Final Report on Adaptive Responsive Nanostructures for Sensing Applications
Wang, Z.; Medforth, C. J.; van Swol, F.; Shelnutt, J. A.; Nov. 2005; 24 pp.; In English
Report No.(s): DE2006-875634; SAND2005-6252; No Copyright; Avail.: National Technical Information Service (NTIS)

Functional organic nanostructures such as well-formed tubes or fibers that can easily be fabricated into electronic and photonic devices are needed in many applications. Especially desirable from a national security standpoint are nanostructures that have enhanced sensitivity for the detection of chemicals and biological (CB) agents and other environmental stimuli. We recently discovered the first class of highly responsive and adaptive porphyrin-based nanostructures that may satisfy these requirements. These novel porphyrin nanostructures, which are formed by ionic self-assembly of two oppositely charged porphyrins, may function as conductors, semiconductors, or photoconductors, and they have additional properties that make them suitable for device fabrication (e.g., as ultrasensitive colorimetric CB microsensors). Preliminary studies with porphyrin nanotubes have shown that these nanostructures have novel optical and electronic properties, including strong resonant light

scattering, quenched fluorescence, and electrical conductivity. In addition, they are photochemically active and capable of light-harvesting and photosynthesis; they may also have nonlinear optical properties. Remarkably, the nanotubes and potentially other porphyrin nanostructure are mechanically responsive and adaptive (e.g., the rigidity of the micrometers-long nanotubes is altered by light, ultrasound, or chemicals) and they self-heal upon removal the environmental stimulus. Given the tremendous degree of structural variation possible in the porphyrin subunits, additional types of nanostructures and greater control over their morphology can be anticipated. Molecular modification also provides a means of controlling their electronic, photonic, and other functional properties. In this work, we have greatly broadened the range of ionic porphyrin nanostructures that can be made, and determined the optical and responsivity properties of the nanotubes and other porphyrin nanostructures. We have also explored means for controlling their morphology, size, and placement on surfaces. The research proposed will lay the groundwork for the use of these remarkable porphyrin nanostructures in micro- and nanoscale devices, by providing a more detailed understanding of their molecular structure and the factors that control their structural, photophysical, and chemical properties.
NTIS
Detection; Nanostructures (Devices); Porphyrins

20060022000 Lawrence Livermore National Lab., Livermore, CA USA
Quantitative Analysis of Supported Membrane Composition using the NanoSIMS
Kraft, M. L.; Foster, S. F.; Marxer, C. G.; Weber, P. K.; Hutcheon, I. D.; Sep. 14, 2005; 16 pp.; In English
Report No.(s): DE2006-875641; UCRL-CONF-215364; No Copyright; Avail.: National Technical Information Service (NTIS)

We have improved methods reported earlier for sample preparation, imaging and quantifying components in supported lipid bilayers using high-resolution secondary ion mass spectrometry performed with the NanoSIMS 50. By selectively incorporating a unique stable isotope into each component of interest, a component-specific image is generated from the location and intensity of the unique secondary ion signals exclusively produced by each molecule. Homogeneous supported lipid bilayers that systematically varied in their isotopic enrichment levels were freeze-dried and analyzed with the NanoSIMS 50. The molecule-specific secondary ion signal intensities had an excellent linear correlation to the isotopically labeled lipid content. Statistically indistinguishable calibration curves were obtained using different sample sets analyzed months apart. Fluid bilayers can be patterned using lithographic methods and the composition of each corralled region varied systematically by simple microfluidic methods. The resulting composition variations can be imaged and quantified. This approach opens the possibility of imaging and quantifying the composition of microdomains within membranes, including protein components, without using bulky labels and with very high lateral resolution and sensitivity.
NTIS
Membranes; Quantitative Analysis

24
COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20060021978 NASA Glenn Research Center, Cleveland, OH, USA
Impact Damage and Strain Rate Effects for Toughened Epoxy Composite Structures
Chamis, Christos C.; Minnetyan, Levon; May 2006; 25 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 754-02-07-03
Report No.(s): NASA/TM-2006-214253; E-15498; Copyright; Avail.: CASI: A03, Hardcopy

Structural integrity of composite systems under dynamic impact loading is investigated herein. The GENOA virtual testing software environment is used to implement the effects of dynamic loading on fracture progression and damage tolerance. Combinations of graphite and glass fibers with a toughened epoxy matrix are investigated. The effect of a ceramic coating for the absorption of impact energy is also included. Impact and post impact simulations include verification and prediction of (1) Load and Impact Energy, (2) Impact Damage Size, (3) Maximum Impact Peak Load, (4) Residual Strength, (5) Maximum Displacement, (6) Contribution of Failure Modes to Failure Mechanisms, (7) Prediction of Impact Load Versus Time, and (8) Damage, and Fracture Pattern. A computer model is utilized for the assessment of structural response, progressive fracture, and defect/damage tolerance characteristics. Results show the damage progression sequence and the changes in the structural response characteristics due to dynamic impact. The fundamental premise of computational

simulation is that the complete evaluation of composite fracture requires an assessment of ply and subply level damage/fracture processes as the structure is subjected to loads. Simulation results for the graphite/epoxy composite were compared with the impact and tension failure test data, correlation and verification was obtained that included: (1) impact energy, (2) damage size, (3) maximum impact peak load, (4) residual strength, (5) maximum displacement, and (6) failure mechanisms of the composite structure.
Author
Strain Rate; Impact Damage; Epoxy Matrix Composites; Composite Structures; Failure Analysis; Structural Failure; Structural Design; Fracturing

20060022724 SRI International Corp., Menlo Park, CA, USA
Diffusion Coatings for Corrosion-Resistant Components in Coal Gasification Systems. (Quarterly Report, July 1, 2005-September 30, 2005)
Jan. 2006; 24 pp.; In English
Report No.(s): DE2006-877701; No Copyright; Avail.: National Technical Information Service (NTIS)

Heat-exchangers, particle filters, turbines, and other components in integrated coal gasification combined cycle system must withstand the highly sulfiding conditions of the high-temperature coal gas over an extended period of time. The performance of components degrades significantly with time unless expensive high alloy materials are used. Deposition of a suitable coating on a low-cost alloy may improve its resistance to such sulfidation attack, and decrease capital and operating costs. The alloys used in the gasifier service include austenitic and ferritic stainless steels, nickel-chromium-iron alloys, and expensive nickel-cobalt alloys. During this period we tested coated alloy coupons under conditions designed to mimic the conditions in the filter unit after the high-temperature heat recovery unit (HTHRU). The filter unit is another important area where corrosion has caused unscheduled downtime, and the remedy has been the use of sintered metal tubes made of expensive alloys such as inconel. The objective of our test was to determine if those coatings on 400-series steel that were not able to withstand the harsher conditions of the HTHRU, may be sufficiently resistant for use in the filter unit, at the reduced temperatures. Indeed, most of our coatings survived well; the exceptions were the coated porous samples of SS316. We continued making improvements to our coatings apparatus and the procedure began during the last quarter. As a result of these modifications, the coupons we are now producing are uniform. We describe the improved procedure for preparing diffusion coatings. Finally, because porous samples of steel in grades other than SS316 are not readily available, we also decided to procure SS409 powder and fabricate our own sintered porous coupons.
NTIS
Coal Gasification; Corrosion Resistance; Diffusion

25
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use of inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see category *34 Fluid Dynamics and Thermodynamics*. For astrochemistry see category *90 Astrophysics*.

20060021603 NASA Glenn Research Center, Cleveland, OH, USA
Phosphate Reactions as Mechanisms of High-Temperature Lubrication
Nagarajan, Anitha; Garrido, Carolina; Gatica, Jorge E.; Morales, Wilfredo; May 2006; 18 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NCC3-1095; NCC3-971; WBS 581-02-07-03
Report No.(s): NASA/TM-2006-214060; E-15417; No Copyright; Avail.: CASI: A03, Hardcopy

One of the major problems preventing the operation of advanced gas turbine engines at higher temperatures is the inability of currently used liquid lubricants to survive at these higher temperatures under friction and wear conditions. Current state-of-the-art organic liquid lubricants rapidly degrade at temperatures above 300 C; hence some other form of lubrication is necessary. Vapor-phase lubrication is a promising new technology for high-temperature lubrication. This lubrication method employs a liquid phosphate ester that is vaporized and delivered to bearings or gears; the vapor reacts with the metal surfaces, generating a solid lubricious film that has proven very stable at high temperatures. In this study, solid lubricious films were grown on cast-iron foils in order to obtain reaction and diffusion rate data to help characterize the growth mechanism. A phenomenological mathematical model of the film deposition process was derived incorporating transport and kinetic

parameters that were coupled to the experimental data. This phenomenological model can now be reliably used as a predictive and scale-up tool for future vapor-phase lubrication studies.
Author
Lubrication; High Temperature Environments; Cast Alloys; Iron Alloys; Reaction Kinetics; Diffusion; Vapor Phase Lubrication

20060021633 Connecticut Univ., Storrs, CT USA
Observations of Runoff Generation During the Dry/Wet Seasonal Transition in Panama
Ogden, Fred L; Oct 31, 2005; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-1-0206
Report No.(s): AD-A447367; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447367; Avail.: Defense Technical Information Center (DTIC)

During 2005, the P.I. and graduate students installed an extensive network of instrumentation near Gamboa, Panama, for the purpose of making observations of hydrologic and hydrometeorological parameters at the hillslope scale. Instrumentation installed include an eddy-correlation flux system on a 36 m tall tower near Cerro Pelado, and throughfall troughs, soil moisture sensors, rain gages, interflow collector, piezometers, and surface flow measurement. Fundamental hypotheses were tested regarding changes in runoff efficiency during the early wet season. Results indicate that at the Gamboa study site, soil water hydrophobicity plays an important role early in the wet season. As the wet season advances, the role of hydrophobicity is diminished, while groundwater levels rise, increasing the occurrence of saturation excess runoff. During the most extreme rainfall event observed (150 mm of rainfall in 24 hours on Christmas Day, 2005), runoff occurred from upland areas likely due to mechanisms other than the traditional saturation excess runoff mechanism. These might include short-term perched water table due to high-intensity rainfall given the significant vertical change in hydraulic conductivities in the soils at Gamboa.
DTIC
Annual Variations; Drainage; Drying; Ground Water; Hydrophobicity; Instruments; Panama; Rain

20060021664 Sachs/Freeman Associates, Inc., Landover, MD USA
Characterization of Silicon Micro-Oscillators by Scanning Laser Vibrometry
Vignola, J F; Liu, X; Morse, S F; Houston, B H; Bucaro, J A; Marcus, M H; Photiadis, D M; Sekaric, L; Oct 2002; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447710; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447710; Avail.: CASI: A02, Hard-copy

The dynamics of single-crystal silicon ;100 mum size rectangular paddle oscillators at room temperature have been studied using a recently developed high-resolution scanning laser vibrometer. The dynamic mechanical behavior is determined by scans of the entire device, providing both amplitude and phase spatial maps of the vibratory response. These reveal more than 16 normal modes below 500 kHz. In addition to simple translation and torsional motion, flexural modes of the paddle plate are observed. Quality factors ranging from 1*10(exp 3) to 2*10(exp 4) are measured and are found to be significantly lower than those expected from well-known intrinsic absorption mechanisms. The measurements reveal that there exists significant modification of the expected eigenfrequencies and mode shapes. It is speculated that this is caused by excessive undercutting of the support structure, and that the resulting energy flow into the support leads to increased oscillator loss. Indeed, some correlation is found between observed loss and energy levels resident in the supports. At frequencies where there is relatively little support motion, three-dimensional finite-element modeling accurately predicts the paddle modal behavior.
DTIC
Energy Transfer; Finite Element Method; High Resolution; Lasers; Oscillators; Silicon; Vibration Measurement

20060021668 Naval Research Lab., Washington, DC USA
Fine Structure of Trious and Excitons in Single GaAs Quantum Dots
Tischler, J G; Bracker, A S; Gammon, D; Park, D; Aug 30, 2002; 5 pp.; In English
Report No.(s): AD-A447717; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447717; Avail.: CASI: A01, Hard-copy

Trions and excitons, localized laterally in quantum-dot-like potentials in GaAs quantum wells, were studied by magnetophotoluminescence spectroscopy as a function of magnetic field strength and orientation. Singletrion spectroscopy

was demonstrated using high spatial resolution. We present a comparative study of the fine structure of single localized excitons and trions.
DTIC
Excitons; Fine Structure; Gallium Arsenides; Magnetic Fields; Quantum Dots; Quantum Wells

20060021669 Naval Research Lab., Washington, DC USA
Spontaneous Growth of an InAs Nanowire Lattice in an InAs/GaSb Superlattice
Nosho, B Z; Bennett, B R; Whitman, L J; Goldenberg, M; Aug 2002; 11 pp.; In English
Report No.(s): AD-A447719; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447719; Avail.: CASI: A03, Hard-copy

We describe a lattice of InAs nanowires that spontaneously organizes in three dimensions within an InAs/GaSb superlattice grown under high As4 flux. As characterized by x-ray diffraction and cross-sectional scanning tunneling microscopy, the periodic nanowires are ~10 nm high, 120 nm wide, and many microns long along [110], with face-centered cubic-like vertical ordering within the superlattice. The unusual vertical ordering creates a lateral composition modulation with half the period of the nanowires. The structure appears to arise from the InAs misfit stress combined with specific InAs and GaSb growth kinetic effects.
DTIC
Gallium; Gallium Antimonides; Indium Arsenides; Nanowires; Scanning Tunneling Microscopy; Superlattices; X Ray Diffraction

20060021670 Naval Research Lab., Washington, DC USA
Direct Observation of the Evolution of Both the HOMO and LUMO Energy Levels of a Silole Derivative at a Magnesium/Silole Interface
Watkins, N J; Maekinen, A J; Gao, Y; Uchida, M; Kafafi, Z H; Jan 2004; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DMR-0305111
Report No.(s): AD-A447720; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447720; Avail.: CASI: A02, Hard-copy

The electronic structure of the interface formed by Mg deposition onto 2,5-bis(6 -(2 ,2 -bipyridyl))-1,1-dimethyl-3,4-diphenyl silacyclopentadiene (PyPySPyPy) was investigated using ultraviolet, inverse, and X-ray photoemission spectroscopies. PyPySPyPy is of interest for use as an electron injection/transport layer in high efficiency organic lightemitting diodes. Upon deposition of Mg onto PyPySPyPy there is a shift of the occupied energy level structure to higher binding energy, away from the Fermi level, and appearance of two energy levels within the energy gap of PyPySPyPy. The lowest unoccupied molecular orbital is also shifted to higher binding energy.
DTIC
Derivation; Energy Levels; Light Emitting Diodes; Magnesium; Nuclear Binding Energy; Observation; Photoelectric Emission

20060021672 Cornell Univ., Ithaca, NY USA
Nanomechanical Resonant Structures in Nanocrystalline Diamond
Sekaric, L; Parpia, J M; Craighead, H G; Feygelson, T; Houston, B H; Butler, J E; Dec 2, 2002; 4 pp.; In English
Report No.(s): AD-A447722; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447722; Avail.: CASI: A01, Hard-copy

We report the fabrication and the operation of nanomechanical resonant structures in nanocrystalline diamond. For this purpose, continuous diamond films as thin as 80 nm were grown using microwave plasma enhanced chemical vapor deposition. The lateral dimensions of the fabricated structures were as small as 50 nm and the measured mechanical resonant frequencies were up to 640 MHz. The mechanical quality factors were in the range of 2500 3000 at room temperature. The elastic properties of these films obtained via the resonant measurements indicate a Young's modulus close to that of single-crystal diamond.
DTIC
Diamond Films; Diamonds; Microelectromechanical Systems; Resonant Frequencies

20060021674 Naval Research Lab., Washington, DC USA

Efficient Molecular Organic Light-Emitting Diodes Based on Silole Derivatives

Palilis, Leonidas C; Maekinen, Antti J; Murata, Hideyuki; Uchida, Manabu; Kafafi, Zakya H; Jan 2003; 16 pp.; In English

Report No.(s): AD-A447724; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447724; Avail.: CASI: A03, Hard-copy

We report the performance of molecular organic light-emitting diodes (MOLEDs) using silole derivatives as emissive and electron transport materials. Two siloles, namely 2,5-di-(3- biphenyl)-1,1-dimethyl-3,4-diphenylsilacyclopentadiene (PPSPP) and 1,2-bis(1-methyl-2,3,4,5,- tetraphenylsilacyclopentadienyl)ethane (2PSP), with high PL quantum yields of 94% and 85%, respectively, were used as emissive materials. Another silole, namely 2,5-bis-(2',2''-bipyridin-6- yl)-1,1-dimethyl-3,4-diphenylsilacyclopentadiene (PyPySPyPy), was used as the electron transport material. MOLEDs using these two siloles and NPB as the hole transport material show a low operating voltage of approximately 4.5 V at a luminance of 100 cd/m2 and high external electroluminescence (EL) quantum efficiencies of 3.4% and 3.8%, respectively, at 100 A/m2. MOLEDs based on PPSPP exhibit a red-shifted EL spectrum which is assigned to an exciplex formed at the PPSPP:NPB interface.
DTIC

Derivation; Light Emitting Diodes; Organic Chemistry

20060021683 Cornell Univ., Ithaca, NY USA

Frequency Entrainment for Micromechanical Oscillator

Zalalutdinov, M; Aubin, K L; Pandey, M; Zehnder, A T; Rand, R H; Craighead, H G; Houston, B H; Aug 18, 2003; 4 pp.; In English

Report No.(s): AD-A447735; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447735; Avail.: CASI: A01, Hard-copy

We demonstrate synchronization of laser-induced self-sustained vibrations of radio-frequency micromechanical resonators by applying a small pilot signal either as an inertial drive at the natural frequency of the resonator or by modulating the stiffness of the oscillator at double the natural frequency. By sweeping the pilot signal frequency, we demonstrate that the entrainment zone is hysteretic and can be as wide as 4% of the natural frequency of the resonator, 400 times the 1/Q ;1024 half-width of the resonant peak. Possible applications are discussed based on the wide range of frequency tuning and the power gain provided by the large amplitude of self-oscillations (controlled by a small pilot signal).
DTIC

Entrainment; Frequencies; Microelectromechanical Systems; Micromechanics; Oscillators; Radio Frequencies; Resonant Frequencies; Resonators

20060021687 Cornell Univ., Ithaca, NY USA

Nondispersive Electron Transport in Alq3

Malliaras, George G; Shen, Yulong; Dunlap, David H; Murata, Hideyuki; Kafafi, Zakya H; Aug 20, 2001; 4 pp.; In English

Contract(s)/Grant(s): DMR-9980100

Report No.(s): AD-A447739; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447739; Avail.: CASI: A01, Hard-copy

We have studied room temperature electron transport in amorphous films of tris (8-hydroxyquinolinolato) aluminum (III) (Alq3) with the time-of-flight technique. Nondispersive photocurrent transients indicate the absence of intrinsic traps in well-purified films. Exposure of the films to ambient atmosphere results in highly dispersive transport, indicating that oxygen is a likely candidate for a trapping site. The mobility was found to obey the Poole Frenkel law. We use the correlated disorder model to determine an effective dipole moment for Alq3, and the corresponding meridional to facial isomeric ratio.
DTIC

Aluminum; Electron Transfer

20060021689 Naval Research Lab., Washington, DC USA

Water-Soluble and Optically pH-Sensitive Single-Walled Carbon Nanotubes from Surface Modification

Zhao, Wei; Song, Chulho; Pehrsson, Pehr E; Jul 26, 2002; 3 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-02-10-140

Report No.(s): AD-A447748; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447748; Avail.: CASI: A01, Hard-copy

There is great interest in using single-walled carbon nanotubes (SWNTs) as nanoscale probes and sensors in biological

electronics and optical devices because the electronic and optical properties of SWNTs are extremely sensitive to the surrounding environments. 1-5 For the applications of SWNTs-based sensors in a biological environment, an immediate question is how the sensors respond to the biological conditions such as pH,5c glucose, various ions, and proteins. This study requires a well-controlled modification of SWNT surfaces to obtain interfaces that are sensitive to these variables.6 The exploration in this exciting area is still not in full blossom, partially due to the difficulty in preparing water-soluble SWNTs while maintaining the SWNT electronic structure intact.4 In light of recent great progress in solubilization of SWNTs in various solvents by polymer wrapping and sidewall functionalization, 3a,4,5b,7-10 a better controlled modification of SWNT surfaces may be realized soon. In this work, we report a facile chemical routine to prepare water-soluble SWNTs that still retain their van Hove singularities after oxidative treatment.7 The solubility in water for as-treated SWNTs with modified surfaces provides us with a unique opportunity to reveal the relationship of their electronic and optical properties with pH. Here we observe that after surface modification with carboxylate groups, the optical absorption of asprepared water-soluble semiconducting SWNTs (Tube\@Rice and HiPco) reversibly responds to the pH change. mL) were prepared by sonication for 1-2 min. No tube precipitation Figure 1. As-treated SWNTs (5-min sonication) in different pH buffer solutions. Figure 2. IR and Raman (532-nm excitation) spectra of thin films of pristine SWNTs and as-treated SWNTs (5-min sonication).
DTIC
Carbon Nanotubes; pH; Sensitivity; Water

20060021691 Naval Research Lab., Washington, DC USA
Thiol Diffusion and the Role of Humidity in 'Dip Pen Nanolithography'
Sheehan, P E; Whitman, L J; Mar 29, 2002; 5 pp.; In English
Report No.(s): AD-A447755; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447755; Avail.: CASI: A01, Hard-copy

The radii of octadecanethiol spots deposited by an atomic force microscope tip onto a gold surface were studied as a function of contact time and humidity. The deposition is well described by twodimensional diffusion from an annular source of constant concentration, with a surface diffusion coeffi- cient of 8400 nm2 s21, independent of humidity. Facile transfer is observed even after near continuous deposition for more than 24 h in a dry N2 environment, indicating that a water meniscus is not required.
DTIC
Diffusion; Humidity; Lithography; Molecules; Nanofabrication; Nanotechnology; Thiols

20060021692 Naval Research Lab., Washington, DC USA
Microgating Carbon Nanotube Field Emitters by In Situ Growth Inside Open Aperture Arrays
Hsu, David S Y; Feb 23, 2002; 4 pp.; In English
Report No.(s): AD-A447756; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447756; Avail.: CASI: A01, Hard-copy

Multiwalled carbon nanotubes were grown using chemical vapor deposition inside small apertures having a horizontal gate and a sidewall insulator spacer. Emission currents up to 140 nA per cell at 63 V have been obtained. These arrays have exhibited a gate current as low as 2.5% of the anode current throughout the entire gate voltage range, representing the lowest gate to anode current ratio of gated nanotube emitters reported to date. We attribute this feature to the emitter geometry and method of fabrication. The overall fabrication method required only a few and simple processing steps.
DTIC
Apertures; Carbon Nanotubes; Emitters

20060021695 Naval Research Lab., Washington, DC USA
Integrally Gated Carbon Nanotube-on-Post Field Emitter Arrays
Hsu, David S Y; Shaw, Jonathan; Oct 17, 2001; 4 pp.; In English
Report No.(s): AD-A447759; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447759; Avail.: CASI: A01, Hard-copy

Carbon nanotubes (cNT) are excellent field emitters on account of their chemical, structural, and electronic properties, which afford important aspects of robustness that have been lacking in the conventional metal and silicon field emitter arrays (FEA). They possess high current-carrying capacity and mechanical strength. Their small diameters (2-50 nm) and high aspect ratios produce high geometric field enhancement, which remains nearly constant even when material is removed from the end of the tubes such as by back ion bombardment. A key contributing factor to their stability as field emitters is the lack of surface

oxide formation. Surface oxide formation on metal or silicon emitters impedes electron transport to the surface and causes changes in the emission characteristics during operation. Furthermore, the oxides could be the main cause for FEA catastrophic destruction by trapping charge which could lead to arcing.1 It has also been suggested that carbon nanotubes do not form nanoprotrusions as metal and silicon cathodes do, thus making current runaway and arcing less likely to occur.2
DTIC
Carbon Nanotubes; Emitters

20060021697 Maryland Univ., College Park, MD USA
Chemical and Electronic Properties of Sulfer-Passivated InAs Surfaces
Petrovykh, D Y; Yang, M J; Whitman, L J; Jan 2002; 26 pp.; In English
Report No.(s): AD-A447761; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447761; Avail.: CASI: A03, Hard-copy

Treatment with ammonium sulfide [(NH4)2Sx] solutions is used to produce model passivated InAs (001) surfaces with well-defined chemical and electronic properties. The passivation effectively removes oxides and contaminants with minimal surface etching, and creates a covalently bonded sulfur layer with good short-term stability in ambient air and a variety of aqueous solutions, as characterized by x-ray photoelectron spectroscopy (XPS), atomic force microscopy, and Hall measurements. The sulfur passivation also preserves the surface charge accumulation layer, increasing the associated downward band bending.
DTIC
Ammonium Compounds; Chemical Properties; Electrical Properties; Indium Arsenides; Sulfides; Sulfur

20060021761 North Carolina State Univ., Raleigh, NC USA
Simultaneous Particle-Imaging Velocimetry and OH Planar Laser-Induced Fluorescence Measurements in an Unsteady Counterflow Propane/Air Diffusion Flame
Welle, Eric J; Roberts, William L; Decroix, Michele E; Carter, Campbell D; Donbar, Jeffrey M; Aug 4, 2000; 8 pp.; In English
Contract(s)/Grant(s): DAAH04-95-10230
Report No.(s): AD-A447893; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447893; Avail.: CASI: A02, Hard-copy

To study the transient response of a diffusion flame to an unsteady flowfield, quantitative measurements of velocity, using particle-imaging velocimetry, and OH measurements, using planar laser-induced fluorescence, were made simultaneously in an oscillating counterflow diffusion flame. These non-intrusive measurements were performed to spatially and temporally resolve flowfield and flame characteristics as a function of initial steady strain rate and forcing frequency. For the forcing frequencies considered in this study, the strain rate fluctuations were found to lag the velocity fluctuations, but the phase difference decreased with increasing forcing frequency. At lower forcing frequencies, the width of the OH field responded quasi-steadily, but as the forcing frequency increased, the OH field showed transient effects. The dilatation velocity, defined as the difference between the minimum velocity in the preheat zone and the maximum velocity in the reaction zone, was used as a flame temperature indicator. The dilatation velocity revealed that the phase difference between the velocity and the temperature increased with increasing forcing frequency, confirming the existence of a diffusion limited response. The results presented here help to illuminate the interconnecting relationships between the chemistry, fluid dynamics, and reactant transport times.
DTIC
Counterflow; Diffusion Flames; Flames; Laser Induced Fluorescence; Particle Image Velocimetry; Propane

20060021863 Army Research Lab., Aberdeen Proving Ground, MD USA
Computational Chemistry-Based Enthalpy-of-Formation, Enthalpy-of-Vaporization, and Enthalpy-of-Sublimation Predictions for Azide-Functionalized Compounds
McQuaid, Michael J; Rice, Betsy M; Apr 2006; 48 pp.; In English
Report No.(s): AD-A447987; ARL-TR-3770; No Copyright; Avail.: CASI: A03, Hardcopy

The applicability of semi-empirical models for estimating the gas-phase enthalpies-of-formation [deltafHog (298)], enthalpies-of-vaporization [deltaHv (298)], and enthalpies-of-sublimation [deltaHs, (298)] of azide-functionalized compounds was evaluated. The models, which rely on B3LYP/6-31G(d) characterizations of the electronic properties of an isolated molecule of a compound, include (1) an atom-equivalent (AE) approach for estimating deltafHog (298) and (2) correlations for estimating deltaHv(298) and deltaH (298) from properties of the electrostatic potential on an electron

isodensity surface. Based on the validation effort, the need to add an equivalent to the AE model that is tailored for azide groups was identified and addressed. However, the AE model's estimates are still prone to systematic error, and deltafHoe (298) estimates derived from B3LYP/6-311++G(d,p)//B3LYP/6-31G(d) calculations are recommended. DeltaHv (298) estimates for azide-functionalized compounds proved to be in reasonable agreement with values derived from experiments and from molecular dynamics simulations. Direct validation of deltaHs (298) estimates was not obtained, but deltafHos (298) estimates derived from deltafHog (298) and deltaHs (298) estimates were found to be in reasonable agreement with deltafHos (298) values derived from experiments. With the validity of the models for azide-functionalized compounds so established, best estimates were obtained for a set of compounds with multiple azide groups that was synthesized by the U.S. Army Armament Research, Development, and Engineering Center.
DTIC
Azides (Inorganic); Azides (Organic); Computational Chemistry; Enthalpy; Sublimation; Vaporizing

20060021866 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
Vapor Pressure of Russian VX
Buchanan, James H; Butrow, Ann B; Abercromble, Patrice L; Buettner, Leonard C; Tevault, David E; Feb 2006; 17 pp.; In English
Report No.(s): AD-A447993; ECBC-TR-480; No Copyright; Avail.: CASI: A03, Hardcopy

O-isobutyl-S-(diethylaminoethyl) methyl phosphonothiolate (RVX) is a highly toxic compound and a structural isomer of the nerve agent, O-ethyl-S-(diisopropylaminoethyl) methyl phosphonothiolate (VX). The vapor pressure of RVX has been measured using a modified ASTM saturation method between -10 and 18 degrees C and a second ASTM method employing differential thermal analysis between 145 and 232 degrees C. Those data and an Antoine fit to the data are presented and compared to an earlier correlation based on data measured over a narrower temperature range.
DTIC
Ethyl Compounds; Russian Federation; Thermal Analysis; Vapor Pressure

20060021882 Maryland Univ., College Park, MD USA
Development of a Novel Continuous Processing Technology for Functionally Graded Composite Energetic Materials Using an Inverse Design Procedure
Bruck, Hugh A; Gallant, Frederick M; Gowrisankaran, Swami; Jan 2006; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-00-1-0472
Report No.(s): AD-A448033; No Copyright; Avail.: CASI: A02, Hardcopy

For a variety of applications, the functional requirement of a material can vary with location within a structure. One way to address this has been to use different materials, joined together so as to take care of the functional requirements at different locations. This unfortunately gives rise to undesirably high stress concentrations at the interface, when the structure is loaded, which might lead to failure. Attempts at controlling these stresses have led to the concept of Functionally Graded Materials (FGMs). FGMs are structures that possess gradual variations in material behavior that enhance material and/or structural performance. For example, at one point the material may be hard and at another point it may be soft. The description of this functional variation is known as the FGM architecture. Typical architectural parameters include layer thickness, t, and composition gradient, p. In designing FGMs, it is desirable to determine the architectural parameters that optimize system performance for a given application by modeling the relationship between the processing of a FGM, the microstructures that develop, and their related properties. FGMs are being applied to a variety of structural and nonstructural applications. Recently, FGM concepts have become of interest to the U.S. Navy to improve large caliber gun propellant performance by replacing a 7-perf grain with a single perf grain that has the same performance, but burns more efficiently because it possesses a functionally graded architecture. In the case of composite energetic materials used as solid rocket propellants, referred to as a grain, the volume fraction of ingredients, such as 30 and 200 micron AP particles (VAP) can be varied along the length of the grain to produce a corresponding difference in burn rate. It can be noted that the burn rate is related not only the volume fraction of AP particles, but the particle size distribution as well.
DTIC
Composite Materials; Explosives; Functionally Gradient Materials; Solid Rocket Propellants

20060021911 Centre National de la Recherche Scientifique, Paris, France

Regimes of Non-Premixed Flame-Vortex Interactions

Thevenin, D; Renard, P H; Fiechtner, G J; Gord, J R; Rolon, J C; Aug 4, 2000; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-95-C-2507

Report No.(s): AD-A448117; No Copyright; Avail.: CASI: A02, Hardcopy

Detailed studies of flame-vortex interactions are extremely valuable to improve our understanding of turbulent combustion regimes. Combined experimental and numerical studies have already been performed in the premixed case during previous investigations. Therefore, we decided to carry out a detailed experimental investigation on the regimes observed during interaction of a vortex ring and a non-premixed, diluted, hydrogen/air, laminar counterflow flame. To obtain the needed information, several optical diagnostic techniques have been used, in particular, planar laser-induced fluorescence (PLIF) of acetone to quantify vortex structure and speed, simultaneous OH PLIF and Rayleigh measurements, and simultaneous OH PLIF and particle-imaging velocimetry (PIV) measurements. A post-processing of the results combined with direct simulations using detailed chemistry and transport models to check the quality of the postprocessing procedures has led to the construction of a spectral interaction diagram. Eight interaction types were found, emphasizing the relative importance of competing physical phenomena such as straining, curvature, wrinkling, roll-up, and extinction. In particular, we observe two different types of extinction, one due to the combined action of curvature and straining, and the other purely due to straining effects. It was also observed that many vortices are too small or dissipate too rapidly to influence the flame. In other cases, the vortex ring can lead to the formation of pockets of oxidizer burning in the fuel part of the domain. These regimes and the limits between them have important implications for the modeling of turbulent non-premixed combustion.

DTIC

Chemical Reactions; Extinction; Flame Propagation; Flames; Flow Distribution; Premixed Flames; Vortices

20060021912 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Treatment of M1 and M8 Propellant Hydrolysates with Immobilized Cell Bioreactors

Guelta, Mark A; DeFrank, Joseph J; Haley, Mark V; Jan 2006; 59 pp.; In English

Contract(s)/Grant(s): OE9969; Proj-778017; Proj-78117

Report No.(s): AD-A448119; ECBC-TR-457; No Copyright; Avail.: CASI: A04, Hardcopy

Chemical agents in bulk form and chemical weapons in assembled rockets and mortars are scheduled to be destroyed in accordance with the Chemical Weapons Convention. Several technologies that include neutralization/biodegradation, supercritical water oxidation, and incineration have been selectively chosen to perform this task. Neutralization followed by biodegradation has been selected as the technology for the destruction of assembled chemical weapons by the Assembled Chemical Weapons Assessment (ACWA) program for mustard containing munitions at the Pueblo Chemical Depot (PCD), Pueblo, CO. As part of the overall destruction, the propellants and explosives from the assembled rounds must also be destroyed. While explosives integral to the assembled round will be processed simultaneously with the munition payload, final disposition of the propellant associated with the chemical round has not been determined. Parsons/Honeywell, the proposed technology provider for PCD, has proposed that the propellants be destroyed in a process similar to that used for hydrolyzed mustard agent: caustic neutralization followed by biodegradation. This laboratory study represents the initial attempt at destroying MI and M8 hydrolyzed propellants using the same immobilized cell bioreactors and culture techniques. System performance was considered inadequate at meeting destruction goals under the operating conditions employed.

DTIC

Biodegradation; Bioreactors; Degradation; Destruction; Hydrolysis; Propellants; Toxicity; Weapon Systems

20060021968 Institute of Gas Technology, Des Plaines, IL USA

Novel Membrane Reactor for Direct Hydrogen Production from Coal. (Quarterly Report, April 1, 2005-June 30, 2005)

Doong, S.; Ong, E.; Atroshenko, M.; Lau, F.; Roberts, M.; Jul. 29, 2005; 26 pp.; In English

Report No.(s): DE2006-842713; No Copyright; Avail.: National Technical Information Service (NTIS)

Gas Technology Institute is developing a novel concept of membrane reactor coupled with a gasifier for high efficiency, clean and low cost production of hydrogen from coal. The concept incorporates a hydrogen-selective membrane within a gasification reactor for direct extraction of hydrogen from coal-derived synthesis gases. The objective of this project is to determine the technical and economic feasibility of this concept by screening, testing and identifying potential candidate membranes under high temperature, high pressure, and harsh environments of the coal gasification conditions. The best performing membranes will be selected for preliminary reactor design and cost estimates. Hydrogen permeation data for several perovskite membranes BCN (BaCe(sub 0.9)Nd(sub 0.1)O(sub 3-x)), SCE (SrCe(sub 0.9)Eu(sub 0.1)O(sub 3)) and

SCTm (SrCe(sub 0.95)Tm(sub 0.05)O(sub 3)) have been successfully obtained for temperatures between 800 and 950 C and pressures from 1 to 12 bar in this project. However, it is known that the cerate-based perovskite materials can react with CO(sub 2). Therefore, the stability issue of the proton conducting perovskite materials under CO(sub 2) or H(sub 2)S environments was examined. Tests were conducted in the Thermo Gravimetric Analyzer (TGA) unit for powder and disk forms of BCN and SCE. Perovskite materials doped with zirconium (Zr) are known to be resistant to CO(sub 2). The results from the evaluation of the chemical stability for the Zr doped perovskite membranes are presented.
NTIS
Coal; Gasification; Hydrogen; Hydrogen Production; Membranes

20060021970 Department of Energy, Washington, DC, USA
Ultrafast Spectroscopy of Delocalized Excited States of the Hydrated Electron. (Final Report, July 1998-December 2004)
Barbara, P. F.; Aug. 25, 2005; 10 pp.; In English
Report No.(s): DE2006-850367; DOE/FG03-98ER14881; No Copyright; Avail.: Department of Energy Information Bridge

Research under support of this grant has been focused on the understanding of highly delocalized conduction-band-like excited states of solvated electrons in bulk water, in water trapped in the core of reverse micelles, and in alkane solvents. We have strived in this work to probe conduction-band-like states by a variety of ultrafast spectroscopy techniques. (Most of which were developed under DOE support in a previous funding cycle.) We have recorded the optical spectrum of the hydrated electron for the first time. This was accomplished by applying a photo-detrapping technique that we had developed in a previous funding cycle, but had not yet been applied to characterize the actual spectrum. In the cases of reverse micelles, we have been investigating the potential role of conduction bands in the electron attachment process and the photoinduced detrapping, and have published two papers on this topic. Finally, we have been exploring solvated electrons in isooctane from various perspectives. All of these results strongly support the conclusion that optically accessible, highly delocalized electronic states exist in these various media.
NTIS
Electrons; Excitation; Spectroscopy

20060022088 Hokkaido Univ., Sapporo, Japan
Low Temperature Science, Volume 64
2005; ISSN 1880-7593; 236 pp.; In English; See also 20060022089 - 20060022113; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

The topics of discussion include: 1) Molecular H2O model with total freedom of motion applied to molecular simulations of water, ice, etc.; 2) Distinguishing two liquid phases of supercooled water; 3) Influence of alkali metal ion on the solvent water molecules: solvent distribution and orbital interaction; 4) Ionization dynamics of water clusters: a direct ab initio molecular dynamic (MD) approach; 5) Quantum chemical calculations for polyhedral (12-, 14-, and 16-hedra) water clusters including gases; 6) First principles calculations from methane hydrate to extrasolar life; 7) First-principles molecular dynamics simulations for physical and chemical properties of water: supercritical water and high-pressure phases of methane hydrate; 8) Study of molecular structure and properties of interlayer water in Na-beidellite by molecular dynamics simulations; 9) Computer simulation studies on the growth kinetics of ice: development of a new H2O potential model and molecular dynamics simulations; 10) Dynamics of ice surface; 11) Quasi-liquid layers and snow crystals; 12) Application of a water polymorphism to an aqueous solution system; 13) Structure and dynamics of amorphous ice and clathrate hydrates; 14) Dynamical structure of water: Raman scattering spectroscopy; 15) Dynamical structure of water-alcohol mixtures: Rayleigh-Brillouin-Raman scattering; 16) Anisotropy of ice plasticity and dislocations in ice: anomalous properties of hexagonal ice I(sub h) associated with cubic structure I(sub c); 17) Studies on disordered proton arrangement and two kinds of locally ordered structure of proton in ice I(sub h); 18) Time-resolved neutron diffraction studies of ice XI; 19) Progress in physical property studies on clathrate hydrates: a review of the ILTS discussion meeting on ice, water and hydrates; 20) Thermodynamic stability of clathrate hydrates; 21) In-situ X-ray changes of gas diffraction study on phase hydrates and the significance for geological and planetary sciences; 22) Microscopic observation and in-situ Raman scattering studies on high-pressure phase transformations and cage occupancy of gas hydrates; 23) Dynamical structure of methane hydrate by neutron inelastic scattering; 24) Radiation effects on ice and clathrate hydrate for chronology and environmental assessment; and 25) Recent studies on the self-preservation effect of gas hydrates.
CASI
Low Temperature; Physical Sciences; Physical Chemistry

20060022089 Institute of Physical and Chemical Research, Japan
First Principles Calculations From Methane Hydrate To Extrasolar Life
Iitaka, Toshiaki; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Water, ice, and methane hydrate are substances that have important influences on life on earth. In this article, I introduce my research on methane hydrate, solid argon, and MgSiO3 post-perovskite, and discuss about my aim of deciphering the history of life and the universe from first principles.
Author
Solidified Gases; Methane; Water; Ice; Hydrates; Perovskites

20060022090 Asahikawa National Coll. of Technology, Asahikawa, Japan
Ionization Dynamics Of Water Clusters: A Direct Ab Initio Molecular Dynamic (MD) Approach
Tachikawa, Hiroto; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Recent work on the ionization dynamics of water clusters (H2O)(sub n). obtained by the full dimensional ab initio molecular dynamics (MD) method were reviewed. The ionization of water and water-clusters plays an important role in neutron irradiation of cooling water in atomic power plants and the photo-reaction of water in atmospheric science. However, the mechanism of the first process in ionization dynamics and detailed features of the initial reactions are unclear because the H2O(+) ion has a high-activity and also the initial reaction of H2O(+) is a very fast process. In this review article, the results for water clusters, the linear form water dimer (n =2) and cyclic water clusters (H2O)(sub n) (n=3-6), were mainly described. Also, a theoretical model for the ionization dynamics of water clusters was proposed on the basis of theoretical results.
Author
Water; Ionization; Atmospheric Chemistry; Molecular Dynamics; Dimers; Nuclear Power Plants

20060022091 Ochanomizu Univ., Tokyo, Japan
Dynamical Structure Of Water: Raman Scattering Spectroscopy
Tominaga, Yasunori; Amo, Yuko; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

We have investigated the dynamical structure of water from Raman spectroscopic viewpoint. Raman spectra of water are never explained by normal vibrations of a H2O molecule. It must be considered that liquid water is conformed by a 3 dimensional hydrogen-bond network. The hydrogen-bond network in liquid water is created and annihilated during ps order, which reflects the central component of Raman spectra. From the analysis of these Raman spectra we have shown that the hydrogen-bond state in liquid water and aqueous solutions can be revealed.
Author
Raman Spectra; Aqueous Solutions; Water; Hydrogen Bonds

20060022092 Tokyo Univ., Japan
Structure And Dynamics Of Amorphous Ice And Clathrate Hydrates
Yamamuro, Osamu; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Amorphous ice and clathrate hydrates of Xe and SF6 were prepared using our homemade cryostat for vapor-deposited samples. Neutron diffraction, small-angle scattering, and inelastic scattering measurements of the prepared samples revealed a cage-like local structure in amorphous clathrate hydrates, structural relaxation far below T(sub g), accompanying structural ordering around the second nearest neighbors, and density homogenization of a 30 A order. The present experiments also clarified the relationship between h)w-energy excitation (boson peak) and the ordering of the hydrogen-bonded systems.
Author
Clathrates; Ice; Amorphous Materials; Cryostats; Vapor Deposition; Sulfur Hexafluoride; Inelastic Scattering; Hydrates

20060022093 National Inst. of Advanced Industrial Science and Technology, Japan
Computer Simulation Studies On The Growth Kinetics Of Ice: Development Of A New H2O Potential Model And Molecular Dynamics Simulations
Nada, Hiroki; vanderEerden, J. P.; Furukawa, Yoshinori; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

We describe computer simulation studies on the crystal growth of ice. An intermolecular potential model of H2 O, which we recently developed for simulation studies on the crystal growth of ice, is explained. Moreover, molecular-scale structures of ice-water interfaces and growth kinetics obtained by molecular dynamics simulations using the model are presented.
Author
Crystal Growth; Computerized Simulation; Ice; Intermolecular Forces; Water; Molecular Structure; Molecular Dynamics

20060022094 Hokkaido Univ., Sapporo, Japan
First-Principles Molecular Dynamics Simulations For Physical And Chemical Properties Of Water: Supercritical Water And High-Pressure Phases Of Methane Hydrate
Terakura, Kiyoyuki; Ikeda, Takashi; Boero, Mauro; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Water can exhibit various properties under various conditions. Despite the long history of research, the elucidation of basic properties of water is still a central subject in physical chemistry and biology. Recent activities in the study of water are reviewed on the following subjects: 1) basic properties of water, 2) supercritical water and its role in chemical reactions, and 3) high-pressure phases of methane hydrate.
Author
Molecular Dynamics; Water; Hydrates; Physical Chemistry; Simulation

20060022095 Hokkaido Univ., Sapporo, Japan
Dynamical Structure Of Methane Hydrate By Neutron Inelastic Scattering
Kamiyama, Takashi; Kiyanagi, Yoshiaki; Iwasa, Hirokatsu; Uchida, Tsutomu; Ebinuma, Takao; Narita, Hideo; FROM; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Clathrate hydrates are nonstoichiometric inclusion compounds with a host framework composed of water molecules. Methane hydrate consists of two kinds of water cages, two pentagonal dodecahedra and six tetrakaidecahedra in a unit cell, which contains one methane molecule in each. It has been said that the methane molecule rotates almost free in the cage. We made measurements of dynamical structure factors over the wide Q-E space using neutron inelastic scattering. The obtained dynamical structure factor S(Q,E) of methane hydrate shows a characteristic feature in Q-E space. The rotational levels of methane coincide with those of a free methane molecule and show a recoil like behavior in the high Q region, meaning that methane molecules in methane hydrate rotate almost freely.
Author
Neutron Scattering; Inelastic Scattering; Hydrates; Clathrates; Q Factors; Methane

20060022096 Kanazawa Univ., Japan
Studies On Disordered Proton Arrangement And Two Kinds Of Locally Ordered Structure Of Proton In Ice I(sub H)
Kawada, Shuji; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Disordered arrangement of proton in ice I(sub h), has been confirmed by studies of Entropy and Structure, and was a useful tool for understanding many properties of ice I(sub h). On the other hands, Bernal-Fowler rule about proton arrangement brings two kinds of locally ordered structures in which protons in those structures polarize. We give these structures the names of F-chain and F-ring. In this paper, F-chain is mainly discussed relating to structures and dc-conductivity in ice I(sub h). Then the several basic properties of F-ring are discussed for following researches.
Author
Order-Disorder Transformations; Ice; Protons

20060022097 Gifu Univ., Gifu, Japan
Microscopic Observation And In-Situ Raman Scattering Studies On High-Pressure Phase Transformations And Cage Occupancy Of Gas Hydrates
Sasaki, Shigeo; Shimizu, Hiroyasu; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Microscopic observation and in-situ Raman scattering studies on high-pressure phase transformations and cage occupancies of single-crystalline Ar, Kr, nitrogen, and methane hydrates were reviewed. In this article we explained the characteristics of these experimental methods for ascertaining high-pressure phase transformations and cage occupancy of

guest molecules. We also discuss the results of the pressure-induced phase transformations and cage occupancy for gas hydrates.
Author
Molecules; Raman Spectra; Phase Transformations; High Pressure; Hydrates; Methane

20060022098 Tsukuba Univ., Japan
In-Situ X-Ray Changes Of Gas Diffraction Study On Phase Hydrates And The Significance For Geological And Planetary Sciences
Hirai, Hisako; Yamamoto, Yoshitaka; Kawamura, Tarou; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Recent high-pressure studies on gas hydrates, including methane hydrate, have accumulated to the extent that we now have a better understanding of the phase changes in gas hydrates. A feature of phase changes in terms of pressure and guest size was summarised earlier in this paper. Gas hydrates with a guest size from argon to methane eventually take a common filled ice I(sub h) structure, although they have different initial and intermediate structures. In the latter part, retention by the filled ice I(sub h), structure of methane hydrate up to 42 GPa is described. In-situ x-ray diffractometry and optical observation revealed the existence of the filled ice structure with as volume change of 40% and large anisotropic compressibility. Symmetrization of the hydrogen bonds in water molecules forming the fundamental structure was suggested to occur. The meanings for geological and planetary sciences of the phase changes and the retention of a very high pressure of methane hydrate are also discussed.
Author
X Ray Diffraction; Methane; Hydrates; Ice; Hydrogen Bonds; Anisotropy; High Pressure

20060022099 National Inst. of Advanced Industrial Science and Technology, Japan
Recent Studies On The Self-Preservation Effect Of Gas Hydrates
Takeya, Satoshi; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

It was found that CH4 hydrate and ice could be stored at an atmospheric pressure below 273 K for long periods; this phenomenon was named as self-preservation. However, a remaining puzzle is the anomalous preservation behavior of CH4 hydrate samples in which the storage stability of CH4 hydrate is greater between 242 and 271 K than it is below 240 K. In this paper, I summarize recent studies on the self-preservation phenomena and discuss the mechanism of self-preservation during dissociation of CH4 hydrate
Author
Hydrates; Atmospheric Pressure; Methane; Ice; Preserving

20060022100 Osaka Univ., Osaka, Japan
Radiation Effects On Ice And Clathrate Hydrate For Chronology And Environmental Assessment
Tani, Atsushi; Norizawa, Kimihiro; Yada, Takeshi; Takeya, Kei; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Radiation effects on amorphous ice, Antarctic ice, rime ice and methane hydrate have been studied by electron spin resonance (ESR) for chronological applications and environmental assessments. In amorphous ice, HO2 radicals formed by UV light exposure decay around 150 K, followed by phase transition from amorphous ice to ice (I(sub c)). In Antarctic ice and lime ice, NO2 was detected after gamma-ray irradiation, suggesting that ESR signals of NO2 may be used as a tracer of NO(x) or NO3(-) in ice. In methane hydrate, methyl radicals formed by gamma-ray irradiation decayed over 193 K, dissociation temperature of methane hydrate. The radical may be stabilized in the cages formed by water molecules.
Author
Radiation Effects; Phase Transformations; Ice; Methane; Electron Paramagnetic Resonance

20060022101 Hokkaido Univ., Sapporo, Japan
Anisotropy Of Ice Plasticity And Dislocations In Ice: Anomalous Properties Of Hexagonal Ice I(Sub H) Associated With Cubic Structure I(Sub C)
Hondoh, Takeo; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

The plasticity of ice, which demonstrates the strongest anisotropy among the various properties of ice, is reviewed in

terms of the characteristic nature of dislocations in ice. Ice is deformed as if all possible sliding systems except for basal sliding are forbidden; like a deck of cards in which the surface is parallel to a basal plane. This peculiar nature of ice plasticity is explained by the characteristic structures of dislocations in ice. or by the fact that it originates with cubic structure I(sub c) embedded in hexagonal ice I(sub h). The dislocation in ice extends over the basal plane because there is a very small energy difference between I(sub h) and I(sub c) that restricts its movement on the basal plane. Even though only the basal system is active in ice plasticity, it is apparent in the text that non-basal systems are also important in the deformation mechanism.
Author
Deformation; Plastic Properties; Ice; Anisotropy

20060022102 Japan Atomic Energy Agency, Japan
Time-Resolved Neutron Diffraction Studies Of Ice XI
Fukazawa, Hiroshi; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Water molecules are dipolar, and neutron diffraction studies provide evidence that ices VIII and IX (the proton ordered phases of ices VII and III) exist as stable low-temperature phases under high pressure. However, under an atmospheric pressure, the proton of "'normal' ice I(sub h) is disordered even though at a very low temperature. A question that has long fascinated researchers is whether there exists a ferroelectric proton-ordered ice named ice XI, as a stable phase and under an atmospheric pressure. This debate becomes a topical subject as: ice XI exists on Pluto? Time-resolved neutron diffraction studies of ice reveal new aspects of this subject.
Author
Neutron Diffraction; Ice; Low Temperature; Protons; Order-Disorder Transformations; Atmospheric Pressure

20060022103 Tokyo Inst. of Tech., Tokyo, Japan
Molecular H2O Model with Total Freedom of Motion Applied to Molecular Simulations of Water, Ice, etc.
Kawamura, Katsuyuki; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

An effective interatomic potential model of a H20 molecule was developed to perform molecular simulations of systems that include H2O molecules. The model has total freedom of motion, with parameters optimized to reproduce structures and physical properties of condensed phases such as water and ice. We demonstrated the efficiency of the model not only for equilibrium properties, but also for molecular vibrational spectra of water and ice-I(sub h) and the dielectric properties of water. Efficient applications to hydrate crystals were also demonstrated.
Author
Molecular Spectra; Water; Ice; Motion Simulation; Condensing

20060022104 Institute of Research and Innovation, Japan
Study Of Molecular Structure And Properties Of Interlayer Water In Na-Beidellite By Molecular Dynamics Simulations
Suzuki, Satoru; Kawamura, Katsuyuki; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

The relationship between molecular structure and the water-clay interaction of interlayer water in sodium type smectite were discussed using molecular dynamics (MD) simulations based on the free flexible force field model. Two distinct bands were found at 3365 and 3500/cm in the stretching vibrational spectrum of interlayer water. The former was assigned to the O-H bond that was not bound to the clay surface, while the latter was attributed to O-H vibrations bound to the clay surface through hydrogen bonding. The hydrogen bond distance (H...O distance) between water and the clay surface (H(sub water) ..... O(sub clay) = 0.22 nm) was larger than that between water molecules (H(sub water) ..... O(sub water) = 0.19 nm). Detailed comparisons of simulation results with IR spectroscopic observations indicated good agreement.
Author
Molecular Structure; Molecular Dynamics; Water; Clays; Hydrogen Bonds; Sodium

20060022105 Nagoya Univ., Nagoya, Japan
Distinguishing Two Liquid Phases Of Supercooled Water
Matsumoto, Masakazu; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Recent studies revealed the liquid-liquid phase transition in the supercooled liquid region of water and silicon. In this article, a new method of classifying the local structure of amorphous water and silicon by the use of pattern matching technique and graph theory is introduced.
Author
Liquid Phases; Water; Phase Transformations; Amorphous Silicon

20060022106 Hokkaido Univ., Sapporo, Japan
Quantum Chemical Calculations For Polyhedral (12-, 14-, And 16-Hedra) Water Clusters Including Gases
Hori, Akira; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Clathrate hydrates are composed of polyhedral water clusters including gas atoms or molecules. Polyhedral water clusters including gases are considered to play an important role for understanding the properties of clathrate hydrates. In this article, I briefly review quantum chemical studies on gas-including polyhedral water clusters.
Author
Water; Clathrates; Molecules; Hydrates

20060022107 Hiroshima Univ., Japan
Influence Of Alkali Metal Ion On The Solvent Water Molecules: Solvent Distribution And Orbital Interaction
Aida, Misako; Tanaka, Masato; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

The distribution of solvent water molecules around an alkali metal ion is calculated using Monte Carlo method and compared with the optimal configuration. The analysis of the orbital interaction between an alkali metal ion and the surrounding solvent molecules is performed for aqueous solutions of Li(+), Na(+) and K(+), by means of ab initio MO method, with the aid of QM/MM method. The effect of alkali metal ion orbitals reaches as far as 6A, 7A and 9A for Li(+), Na(+) and K(+), respectively. This effect is caused by the orbital interactions between the valence orbitals of an alkali metal ion and of the surrounding water molecules. Not only the electrostatic interaction but also the orbital interaction must not be neglected. The difference in the effect between the alkali metal ions is originated from the difference in the valence orbital extensions of the alkali metal ions.
Author
Alkali Metals; Metal Ions; Aqueous Solutions; Electrostatics; Molecules; Monte Carlo Method

20060022108 Meiji Univ., Kawasaki, Japan
Dynamics of Ice Surface
Ikeda-Fukazawa, Tomoko; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

The surface of ice and snow is slippery. This slipperiness property of ice surface has usually been explained by a lubricating layer of water film, which exists on the surface. Ice crystals have a melting layer on the surface even at low temperatures below the bulk melting point. The surface melting of ice plays a fundamental role in many phenomenon found in our everyday life as in charge transfers in thunderstorms, frost heave, and in winter sports such as skiing and skating. Further, chemical reactions in the melting layer of ice accelerate the destruction of the ozone layer in the stratosphere. I review the dynamics of the ice surface and the effects of the dynamics on the formation process of the melting layer on ice surface.
Author
Ice; Surface Temperature; Melting Points; Crystals

20060022109 Rikkyo Univ., Japan
Quasi-liquid Layers and Snow Crystals
Sato, Kanako; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Growth forms of snow crystals are closely related to the surface structures of ice. Over several decades, various experiments have revealed the existence of quasi-liquid layers on ice surfaces. In this paper we introduce a macroscopic model

of the quasi-liquid layers proposed by Lacmann and Stranski in 1972. Based on this model, we analyze the properties of these quasi-liquid layers and explain the phase diagram of snow crystals.
Author
Liquid Crystals; Snow; Ice; Liquid Phases

20060022110 National Inst. for Materials Science, Tsukuba, Japan
Application Of A Water Polyamorphism To An Aqueous Solution System
Suzuki, Yoshiharu; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Recent studies of supercooled liquid water and amorphous ices indicate that two distinct liquid waters exist at low temperatures. This new concept related to liquid water is called ‘a water polyamorphism’. In this paper, the application of water polyamorphism to an aqueous solution system is discussed. We vitrified a dilute aqueous solution using several quenching-methods and measured the OH stretching vibrational Raman mode of the glassy dilute aqueous solutions. Raman studies indicate that the number of the glassy state of a solvent in an aqueous solution may be at least three. At this stage, the results are consistent with a water polyamorphism.
Author
Amorphous Materials; Water; Low Temperature; Aqueous Solutions

20060022111 Ochanomizu Univ., Tokyo, Japan
Dynamical Structure Of Water-Alcohol Mixtures: Rayleigh-Brillouin-Raman Scattering
Tominaga, Yasunori; Amo, Yuko; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Rayleigh-Brillouin and low-frequency Raman scattering were performed for water and alcohol (methanol, ethanol, 1-propanol and 2-propanol) binary mixtures. The Landau-Placzek ratio obtained from Rayleigh-Brillouin spectra depends on both concentration and molecular weight, and qualitatively corresponds to the ultrasonic absorption. Microscopic concentration fluctuations mainly affect on the Landau-Placzek ratio of water-alcohol mixtures. Deduced Raman spectra, X"(v), of the mixtures can be decomposed into a linear combination of pure water and neat ethanol in the frequency range from 40/cm_ to 250/cm. Below 40/cm, the spectra cannot be decomposed into the linear combination and systematic deviations are found. The results indicate that the microscopic aggregation of water and ethanol molecules depends on the mixing ratio.
Author
Rayleigh Scattering; Raman Spectra; Ethyl Alcohol; Water; Mixing Ratios; Methyl Alcohol; Brillouin Effect; Binary Mixtures

20060022112 Hokkaido Univ., Sapporo, Japan
Progress In Physical Property Studies On Clathrate Hydrates: A Review Of The ILTS Discussion Meeting On Ice, Water And Hydrates
Uchida, Tsutomu; Itoh, Hidenosuke; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

Physical property studies on clathrate hydrates have remarkably advanced in the last decade. This has been supported by researchers seeking to reveal the physical properties of the complex material, clathrate hydrates. Application of various experimental techniques to the measurement of clathrate hydrates and performing large-scale and accurate simulations utilizing new computer technologies are also reasons for this advancement. Here we review the studies on clathrate hydrates presented at this meeting and state the progress being made in hydrate research.
Author
Hydrates; Clathrates; Progress; Ice; Water

20060022113 Okayama Univ., Japan
Thermodynamic Stability of Clathrate Hydrates
Tanaka, Hideki; Koga, Kenichiro; Low Temperature Science, Volume 64; 2005; In Japanese; See also 20060022088; Copyright; Avail.: Other Sources

We have extended the van der Waals and Platteeuw theory to treat multiple occupancy of a single cage of clathrate hydrates. We propose a simple way to calculate the free energy of multiple cage occupancy, and then apply it to an argon clathrate structure II in which a larger cage can be occupied by two argon atoms. It is found that double occupancy dominates

over single occupancy when the guest pressure in equilibrium with the clathrate hydrate exceeds 270 MPa.
Author
Thermodynamics; Stability; Clathrates; Hydrates

20060022633 NASA Johnson Space Center, Houston, TX, USA
Microwave-assisted Extraction of Rare Earth Elements from Petroleum Refining Catalysts and Ambient Fine Aerosols Prior to Inductively Coupled Plasma - Mass Spectrometry
Mittlefehldt, David W.; Kulkarni, Pranav; Chellam, Shankar; [2006]; 31 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

In the absence of a certified reference material, a robust microwave-assisted acid digestion procedure followed by inductively coupled plasma - mass spectrometry (ICP-MS) was developed to quantify rare earth elements (REEs) in fluidized-bed catalytic cracking (FCC) catalysts and atmospheric fine particulate matter (PM2.5). High temperature (200 C), high pressure (200 psig), acid digestion (HNO3, HF, and H3BO3) with 20 minute dwell time effectively solubilized REEs from six fresh catalysts, a spent catalyst, and PM2.5. This method was also employed to measure 27 non-REEs including Na, Mg, Al, Si, K, Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, As, Se, Rb, Sr, Zr, Mo, Cd, Cs, Ba, Pb, and U. Complete extraction of several REEs (Y, La, Ce, Pr, Nd, Tb, Dy, and Er) required HF indicating that they were closely associated with the aluminosilicate structure of the zeolite FCC catalysts. Internal standardization using 115In quantitatively corrected non-spectral interferences in the catalyst digestate matrix. Inter-laboratory comparison using ICP-optical emission spectroscopy (ICP-OES) and instrumental neutron activation analysis (INAA) demonstrated the applicability of the newly developed analytical method for accurate analysis of REEs in FCC catalysts. The method developed for FCC catalysts was also successfully implemented to measure trace to ultra-trace concentrations of La, Ce, Pr, Nd, Sm, Gd, Eu, and Dy in ambient PM2.5 in an industrial area of Houston, TX.
Author
Aerosols; Extraction; Inductively Coupled Plasma Mass Spectrometry; Microwaves; Rare Earth Elements; Refining; Catalysts; Ambient Temperature

20060022704 Virginia Univ., Charlottesville, VA, USA
Hydrogen Adsorption Studies Using Surface Acoustic Waves on Nanoparticles
Phillips, A. B.; Myneni, G.; Shivaram, B. S.; January 2005; 10 pp.; In English
Report No.(s): DE2006-876016; No Copyright; Avail.: Department of Energy Information Bridge

Vanadium nanoparticles, on the order of 20 nm, were deposited on a quartz crystal surface acoustic wave resonator (SAW) using a Nd:YAG pulsed laser deposition system. Due to the high Q and resonant frequency of the SAW, mass changes on the order of 0.1 nanogram can be quantitatively measured. Roughly 60 nanogram of V was deposited on the SAW for these experiments. The SAW was then moved into a hydrogen high pressure cell.At room temperature and 1 atmosphere of hydrogen pressure, 1 wt% H, or H/V (approx) 0.5 (atomic ratio) absorption was measured.
NTIS
Adsorption; Hydrogen; Nanoparticles; Sound Waves; Surface Waves; Vanadium

26
METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20060021638 Litton Industries, Pascagoula, MS USA
Evaluation of The Fillet Weld Shear Strength of Flux Cored ARC Welding Electrodes
Sep 1989; 53 pp.; In English
Contract(s)/Grant(s): MA80-SAC-01041
Report No.(s): AD-A447523; NSRP-0297; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447523; Avail.: Defense Technical Information Center (DTIC)

This paper presents results of a research project conducted by the Welding Engineering Dept. at Ingalls Shipbuilding. The primary effort of this project was directed towards the development of shear strength data for flux cored arc (FCAW) welding electrodes. The current welding design document for U.S. Navy construction, does not include fillet weld shear strength values

for this widely used process. Presently, the equivalent shielded metal arc (SWAW) welding electrode values are used for design purposes.
DTIC
Arc Welding; Cores; Electrodes; Fillets; Shear Strength; Weld Strength; Welding

20060021739 Air Force Research Lab., Wright-Patterson AFB, OH USA
Comparative Analysis of Three Fretting Fatigue Fixtures (Preprint)
Golden, Patrick J; Hutson, Alisha L; Bartha, Bence B; Nicholas, Theodore; Feb 2006; 29 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A447846; AFRL-ML-WP-TP-2006-405; No Copyright; ONLINE:
http://hdl.handle.net/100.2/ADA447846; Avail.: CASI: A03, Hardcopy

Three fixtures for conducting laboratory fretting fatigue tests are described and their respective testing methods and the results of the analysis are compared. Each of these fixtures has been used to investigate the effects of various parameters of interest in fretting fatigue. These fixtures include a unique apparatus in which all load applied to the specimen is transferred to the fretting pads, an apparatus similar to many found in the literature where partial load transfer occurs across the pads, and a simplified dovetail fixture in which the clamping load, P, and the shear load, Q, are varied in phase. Select test conditions from prior experiments performed on identical material and resulting in similar lives ranging from 1 to 10 million cycles from these fixtures are identified. The various testing conditions were used to compute the unique stress field for each case. The resulting contact stresses were used to calculate crack initiation based criteria, and to calculate stress intensity factors. The three fixtures were shown to be able to accommodate a range of loads, fretting pad contours, and specimen geometries that produced a variety of stress fields. A crack-initiation-based criterion was shown to predict the failure lives of thinner specimens accurately. The stress intensity factor calculations showed the possibility of a crack arresting for a stress field that decays rapidly and the possibility of a local minimum for K as a function of depth. The fixtures are shown to be complementary in generating data for development of robust fretting fatigue models that use these criteria.
DTIC
Fixtures; Fretting; Shear Properties; Stress Intensity Factors

20060022712 Pennsylvania State Univ., University Park, PA, USA
Improved Tubulars for Better Economics in Deep Gas Well Drilling using Microwave Technology. (Annual Report, October 1, 2004-September 30, 2005)
Agrawal, D.; Gigl, P.; Dennis, M.; Feb. 2006; 20 pp.; In English
Report No.(s): DE2006-876434; No Copyright; Avail.: Department of Energy Information Bridge

The objective of the research program has been to improve the rate-of-penetration in deep hostile environments by improving the life cycle and performance of coiled-tubing, an important component of a deep well drilling system for oil and gas exploration. The current process of the manufacture long tubular steel products consists of shaping the tube from flat strip, welding the seam and sections into lengths that can be miles long, and coiling onto reels. However, the welds, that are a weak point, now limit the performance of the coil tubing. This is not only from a toughness standpoint but also from a corrosion standpoint. By utilizing the latest developments in the sintering of materials with microwave energy and powder metal extrusion technology for the manufacture of seamless coiled tubing and other tubular products, these problems can be eliminated. The project is therefore to develop a continuous microwave process to sinter continuously steel tubulars and butt-join them using microwave/induction process. The program started about three years ago and now we are in the middle of Phase II.
NTIS
Drilling; Economics; Microwave Equipment; Natural Gas; Pipes (Tubes); Steels; Wells

27
NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials*.

20060021819 Alabama Univ., Birmingham, AL USA
Selection of a Material Model for Simulating Concrete Masonry Walls Subjected to Blast
Davidson, James S; Moradi, Lee; Dinan, Robert J; Feb 2004; 147 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F08637-02-C-7027; Proj-4918
Report No.(s): AD-A447920; No Copyright; Avail.: Defense Technical Information Center (DTIC)

One of the most common methods of construction is the use of concrete masonry units (CMU) in the walls of buildings. However, they are vulnerable to blast, and result in collapse, fragmentation, and severe injury to occupants. An understanding of the behavior of CMU walls during blast is key to developing mitigation techniques. Research has been conducted using the finite element method to simulate structural failure due to blast. A common problem faced by model developers is the selection of constitutive relationships that appropriately simulate the behavior of materials subjected to shock loading. This project examined the effect of blast impulse loading on CMU blocks. Finite element models were used to perform direct transient analysis using various material cards available in LS-DYNA, and the results were compared to the results of full-scale blast tests conducted by AFRL. The material card that best agreed with the test results was recommended for use in the models of polymer reinforced masonry walls.
DTIC
Computer Programs; Concretes; Masonry; Simulation; Walls

20060021859 Boeing Co., Seattle, WA USA
Air Vehicle Technology Integration Program (AVTIP). Delivery Order 0033: Advanced Sol-Gel Adhesion Processes - Transition Support
Blohowiak, Kay Y; Grob, Jacob W; Seebergh, Jill E; Jul 2005; 80 pp.; In English
Contract(s)/Grant(s): F33615-00-D-3052-0033; Proj-2401
Report No.(s): AD-A447980; No Copyright; Avail.: CASI: A05, Hardcopy

This report summarizes optimization and transition support work for surface preparations utilizing nanostructured sol-gel coatings on metal alloy substrates. The project focuses on optimization and transition of user-friendly sol-gel methods for preparing metal surfaces for bonding with 250 deg F-cure epoxy adhesives. Studies indicate that careful choice of abrasive media and tools is required to achieve reproducible performance for the surface preparation of aluminum alloys. Verification of these processes and expansion of the processing guidelines were determined under this effort. Transition of materials and processing information and support of transition efforts to specific customers was provided throughout the effort. Procedures were documented specifying all of the preferred materials and processes.
DTIC
Adhesion; Adhesives; Sol-Gel Processes

20060021966 Harvard Univ., Cambridge, MA, USA
Microtextured Silicon Surfaces for Detectors, Sensors, and Photovoltaics. (Final Report, November 1, 2000-March 31, 2005)
Mazur, E.; January 2005; 210 pp.; In English
Report No.(s): DE2006-840172; No Copyright; Avail.: National Technical Information Service (NTIS)

With support from this award we studied a novel silicon microtexturing process and its application in silicon-based infrared photodetectors. By irradiating the surface of a silicon wafer with intense femtosecond laser pulses in the presence of certain gases or liquids, the originally shiny, flat surface is transformed into a dark array of microstructures. The resulting microtextured surface has near-unity absorption from near-ultraviolet to infrared wavelengths well below the band gap. The high, broad absorption of microtextured silicon could enable the production of silicon-based photodiodes for use as inexpensive, room-temperature multi-spectral photodetectors. Such detectors would find use in numerous applications including environmental sensors, solar energy, and infrared imaging. The goals of this study were to learn about microtextured surfaces and then develop and test prototype silicon detectors for the visible and infrared. We were extremely successful in achieving our goals. During the first two years of this award, we learned a great deal about how microtextured surfaces form and what leads to their remarkable optical properties. We used this knowledge to build prototype detectors with high sensitivity in both the visible and in the near-infrared. We obtained room-temperature responsivities as high as 100 A/W at 1064 nm, two orders of magnitude higher than standard silicon photodiodes. For wavelengths below the band gap, we obtained responsivities as high as 50 mA/W at 1330 nm and 35 mA/W at 1550 nm, close to the responsivity of InGaAs photodiodes and five orders of magnitude higher than silicon devices in this wavelength region.
NTIS
Infrared Radiation; Photometers; Photovoltaic Conversion; Silicon

20060021995 TDA Research, Inc., Wheat Ridge, CO, USA
Improved Fuel Efficiency from Nanocomposite Tire Tread. (Final Report)
Myers, A. W.; January 2005; 18 pp.; In English
Report No.(s): DE2006-875756; No Copyright; Avail.: Department of Energy Information Bridge

Rolling resistance, a measure of the energy lost as a tire rotates while moving, is a significant source of power and fuel loss. Recently, low rolling resistant tires have been formulated by adding silica to tire tread. These 'Green Tires' (so named from the environmental advantages of lower emissions and improved fuel economy) have seen some commercial success in Europe, where high fuel prices and performance drive tire selection. Unfortunately, the higher costs of the silica and a more complicated manufacturing process have prevented significant commercialization - and the resulting fuel savings - in the U.S. In this project, TDA Research, Inc. (TDA) prepared an inexpensive alternative to silica that leads to tire components with lower rolling resistance. These new tire composite materials were processed with traditional rubber processing equipment. We prepared specially designed nanoparticle additives, based on a high purity, inorganic mineral whose surface can be easily modified for compatibility with tire tread formulations. Our nanocomposites decreased energy losses to hysteresis, the loss of energy from the compression and relaxation of an elastic material, by nearly 20% compared to a blank SBR sample. We also demonstrated better performance than a leading silica product, with easier production of our final rubber nanocomposite.
NTIS
Nanocomposites; Tires; Treads

20060022643 NASA Johnson Space Center, Houston, TX, USA
Flexible Fabrics with High Thermal Conductivity for Advanced Spacesuits
Trevino, Luis A.; Bue, Grant; Orndoff, Evelyne; Kesterson, Matt; Connel, John W.; Smith, Joseph G., Jr.; Southward, Robin E.; Working, Dennis; Watson, Kent A.; Delozier, Donovan M., et al.; January 2006; 13 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

This paper describes the effort and accomplishments for developing flexible fabrics with high thermal conductivity (FFHTC) for spacesuits to improve thermal performance, lower weight and reduce complexity. Commercial and additional space exploration applications that require substantial performance enhancements in removal and transport of heat away from equipment as well as from the human body can benefit from this technology. Improvements in thermal conductivity were achieved through the use of modified polymers containing thermally conductive additives. The objective of the FFHTC effort is to significantly improve the thermal conductivity of the liquid cooled ventilation garment by improving the thermal conductivity of the subcomponents (i.e., fabric and plastic tubes). This paper presents the initial system modeling studies, including a detailed liquid cooling garment model incorporated into the Wissler human thermal regulatory model, to quantify the necessary improvements in thermal conductivity and garment geometries needed to affect system performance. In addition, preliminary results of thermal conductivity improvements of the polymer components of the liquid cooled ventilation garment are presented. By improving thermal garment performance, major technology drivers will be addressed for lightweight, high thermal conductivity, flexible materials for spacesuits that are strategic technical challenges of the Exploration
Author
Fabrics; Garments; Thermal Conductivity; Space Suits; Heat Transfer; Liquid Cooling; Temperature Effects

28
PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*; and *44 Energy Production and Conversion*.

20060021726 Reaction Engineering International, Salt Lake City, UT USA
Reduced Chemical Kinetic Mechanisms for Hydrocarbon Fuels
Montgomery, Christopher J; Cremer, Marc A; Heap, Michael P; Chen, Jhy-Yuan; Westbrook, Charles K; Maurice, Lourdes Q; Jun 1999; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-98-C-2831
Report No.(s): AD-A447824; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447824; Avail.: CASI: A03, Hard-copy

Using CARM (Computer Aided Reduction Method), a computer program that automates the mechanism reduction process, a variety of different reduced chemical kinetic mechanisms for ethylene and n-heptane have been generated. The reduced mechanisms have been compared to detailed chemistry calculations in simple homogeneous reactors and experiments. Reduced mechanisms for combustion of ethylene having as few as 10 species were found to give reasonable agreement with detailed chemistry over a range of stoichiometries and showed significant improvement over currently used global mechanisms. The performance of reduced mechanisms derived from a large detailed mechanism for n-heptane was compared

to results from a reduced mechanism derived from a smaller semi-empirical mechanism. The semi-empirical mechanism was advantageous as a starting point for reduction for ignition delay but not for PSR calculations. Reduced mechanisms with as few as 12 species gave excellent results for n-heptane/air PSR calculations but 16-25 or more species are needed to simulate n-heptane ignition delay.
DTIC
Fuels; Hydrocarbon Fuels; Hydrocarbons; Reaction Kinetics

20060021727 Reaction Engineering International, Salt Lake City, UT USA
Reduced Chemical Kinetic Mechanisms for JP-8 Combustion
Montgomery, Christopher J; Cannon, S M; Mawid, M A; Sekar, B; Jan 2002; 12 pp.; In English
Contract(s)/Grant(s): F33615-00-C-2016
Report No.(s): AD-A447825; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447825; Avail.: CASI: A03, Hard-copy

Using CARM (Computer Aided Reduction Method), a computer program that automates the mechanism reduction process, six different reduced chemical kinetic mechanisms for JP-8 combustion have been generated. The reduced mechanisms have been compared to detailed chemistry calculations in simple homogeneous reactor calculations. Reduced mechanisms containing 15 and 20 species were found to give good agreement for both temperature and species concentrations (including NO) in adiabatic perfectly stirred reactor calculations for inlet temperatures from 300-1300 K, pressures from 10-40 atm, stoichiometric ratios from 0.5-2.0 and reactor residence times from 0.1 sec. to near blowout. Reduced mechanisms have also been created that compare well to available ignition delay measurements for JP-8.
DTIC
Combustion; Jet Engine Fuels; JP-8 Jet Fuel; Reaction Kinetics

20060021889 Marine Corps Combat Development Command, Quantico, VA USA
Marine Corps Bulk Liquid Transportation
Drexler, Jonathan; Zaffram, Launa; Stephens, Cortez; Taylor, Lori; Jun 23, 2005; 34 pp.; In English; Original contains color illustrations
Report No.(s): AD-A448046; No Copyright; Avail.: CASI: A03, Hardcopy

STUDY OBJECTIVE: Address the Marine Corps capability to provide bulk fuel and water transportation support for Marine Air Ground Task Force (MAGTF) operations: (1) Examine the capability of current equipment and processes to transport bulk fuel and water; (2) Examine the capability of other equipment and processes, not currently employed by the Marine Corps, to transport bulk fuel and water. This brief will focus on the fuel transportation piece of the study.
DTIC
Fuels; Transportation

20060021979 NASA Glenn Research Center, Cleveland, OH, USA
Hybrid Solid Oxide Fuel Cell/Gas Turbine System Design for High Altitude Long Endurance Aerospace Missions
Himansu, Ananda; Freeh, Joshua E.; Steffen, Christopher J., Jr.; Tornabene, Robert T.; Wang, Xiao-Yen J.; May 2006; 18 pp.; In English; Fourth International ASME Conference on Fuel Cell Science, Engineering and Technology, 19-21 Jun. 2006, Irvine, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS3-03072; WBS 581-02-08-03
Report No.(s): NASA/TM-2006-214328; E-15560; FUELCELL2006-97095; No Copyright; Avail.: CASI: A03, Hardcopy

A system level analysis, inclusive of mass, is carried out for a cryogenic hydrogen fueled hybrid solid oxide fuel cell and bottoming gas turbine (SOFC/GT) power system. The system is designed to provide primary or secondary electrical power for an unmanned aerial vehicle (UAV) over a high altitude, long endurance mission. The net power level and altitude are parametrically varied to examine their effect on total system mass. Some of the more important technology parameters, including turbomachinery efficiencies and the SOFC area specific resistance, are also studied for their effect on total system mass. Finally, two different solid oxide cell designs are compared to show the importance of the individual solid oxide cell design on the overall system. We show that for long mission durations of 10 days or more, the fuel mass savings resulting from the high efficiency of a SOFC/GT system more than offset the larger powerplant mass resulting from the low specific power of the SOFC/GT system. These missions therefore favor high efficiency, low power density systems, characteristics typical of fuel cell systems in general.
Author
Gas Turbine Engines; High Altitude; Solid Oxide Fuel Cells; Systems Engineering; Space Missions; Aerospace Sciences

29
SPACE PROCESSING

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced-gravity environments. For legal aspects of space commercialization see *84 Law, Political Science and Space Policy*.

20060021945 NASA Glenn Research Center, Cleveland, OH, USA

Conceptual Design of a Condensing Heat Exchanger for Space Systems Using Porous Media

Hasan, Mohammad M.; Khan, Lutful I.; Nayagam, Vedha; Balasubramaniam, Ramaswamy; May 2006; 13 pp.; In English; 35th International Conference on Environmental Systems (ICES), 11-14 Jul. 2005, Rome, Italy; Original contains color illustrations

Contract(s)/Grant(s): WBS 22-101-13-50

Report No.(s): NASA/TM-2006-214130; Rept-2005-01-2812; E-15464; Copyright; Avail.: CASI: A03, Hardcopy

Condensing heat exchangers are used in many space applications in the thermal and humidity control systems. In the International Space Station (ISS), humidity control is achieved by using a water cooled fin surface over which the moist air condenses, followed by 'slurper bars' that take in both the condensate and air into a rotary separator and separates the water from air. The use of a cooled porous substrate as the condensing surface provides and attractive alternative that combines both heat removal as well as liquid/gas separation into a single unit. By selecting the pore sizes of the porous substrate a gravity independent operation may also be possible with this concept. Condensation of vapor into and on the porous surface from the flowing air and the removal of condensate from the porous substrate are the critical processes involved in the proposed concept. This paper describes some preliminary results of the proposed condensate withdrawal process and discusses the on-going design and development work of a porous media based condensing heat exchanger at the NASA Glenn Research Center in collaboration with NASA Johnson Space Center.

Author

Condensing; Heat Exchangers; Porosity; International Space Station; Air Flow

31
ENGINEERING (GENERAL)

Includes general research topics related to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.

20060021578 Old Dominion Univ., Norfolk, VA USA

Graduate Level Modeling and Simulation Overview Course

Petty, Mike D; Kincaid, J P; Loper, Margaret L; Mar 24, 2006; 31 pp.; In English

Contract(s)/Grant(s): N00014-03-1-094S

Report No.(s): AD-A447324; No Copyright; Avail.: CASI: A03, Hardcopy

This document reports the results of a project to develop and test the content of a graduate level modeling and simulation overview course. This report was prepared for the Defense Modeling and Simulation Office (DMSO) by the Virginia Modeling, Analysis and Simulation Center of Old Dominion University, with inputs from both the University of Central Florida and the Georgia Institute of Technology. It describes work done under and is the final report for contract N00014-03-1-094S 'Graduate level Modeling and Simulation Overview Course'. The Old Dominion University Research Foundation project number is 234921.

DTIC

Simulation; Education

20060021815 Army Test and Evaluation Command, Aberdeen Proving Ground, MD USA

Standardized UXO Technology Demonstration Site Moguls Scoring Record No. 665 (Geophex, LTD.)

Overbay, Larry; Fling, Rick; McClung, Christina; Robitaille, George; Banta, Matthew; Nov 2005; 49 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-8-CO-160-UXO-021

Report No.(s): AD-A447914; ATC-9127; No Copyright; Avail.: CASI: A03, Hardcopy

This scoring record documents the efforts of Geophex, Ltd. to detect and discriminate inert unexploded ordnance (UXO) utilizing the APG Standardized UXO Technology Demonstration Site Moguls. Scoring records have been coordinated by

Larry Overbay and the Standardized UXO Technology Demonstration Site Scoring Committee. Organizations on the committee include the U.S. Army Corps of Engineers, the Environmental Security Technology Certification Program, the Strategic Environmental Research and Development Program, the Institute for Defense Analysis, the U.S. Army Aberdeen Test Center.
DTIC
Ordnance; Scoring; Standardization

20060022069 Condition Monitoring and Diagnostic Engineering Management International, Birmingham, UK
International Journal of COMADEM, Vol. 9, No. 2
Rao, B. K. N., Editor; April 2006; ISSN 1363-7681; 48 pp.; In English; See also 20060022070 - 20060022072; Copyright; Avail.: Other Sources

Topics discussed include: A Requirements Management Approach Supporting Integrated Health Management System Design; The Extended Kalman Filter as a Tool for Condition Monitoring in Hydraulic Systems; and Condition Monitoring & Failure Diagnosis of Engineering and Manufacturing Systems. Part I: Vibro - Acoustic Monitoring.
Derived from text
Systems Engineering; Acoustics; Kalman Filters; Management Systems; Vibrational Stress; Systems Integration

20060022070 Indira Gandhi Centre for Atomic Research, Kalpakkam, India
Condition Monitoring and Failure Diagnosis of Engineering and Manufacturing Systems, Part 1, Vibro-Acoustic Monitoring
Mukhopadhyay, C. K.; Jayakumar, T.; Raj, Baldev; Rao, B. K. N.; International Journal of COMADEM, Vol. 9, No. 2; April 2006, pp. 23-40; In English; See also 20060022069; Copyright; Avail.: Other Sources

We live in a sensory world. Machinery vibration and noise play a major part in this sensory world and it occupies a very limited range within the broad electromagnetic spectrum. Modern engineering and manufacturing systems and their components are designed to safely withstand various severities throughout their operational life-cycles. While there are some positive and beneficial effects associated with this environment, there are many reported instances where the performance, reliability, safety and health of both physical and human assets have significantly deteriorated, thereby shortening not only the useful life-cycle but also the availability, maintainability and productivity of these valuable assets. Intelligent sensing, monitoring and diagnosing the root cause failure of these industrial assets is now more urgent than ever before. With the increasing trend in the design, manufacturing, installation, operation, maintenance and disposal of sophisticated and complex systems worldwide, continuous improvement of these assets is considered to be the only way forward to sustain and prosper in this highly competitive world of today. Over the years, this field has been at the center of global attention by many academic, industrial and research and development community. The economic benefits are obvious. In the first part of the State-of-the-art review, the authors have attempted to highlight some of the current trends and progress in the world of vibration and acoustic emission technology for condition monitoring applications.
Author
Acoustic Emission; Electromagnetic Spectra; Productivity; Complex Systems; Detection; Manufacturing; Reliability

20060022071 Occupational Health and Safety Research Inst., Montreal, Quebec, Canada
The Extended Kalman Filter as a Tool for Condition Monitoring in Hydraulic Systems
Chinniah, Yuvin; International Journal of COMADEM, Vol. 9, No. 2; April 2006, pp. 14-22; In English; See also 20060022069; Copyright; Avail.: Other Sources

In this paper, the extended Kalman filter (EKF) is presented as a condition monitoring strategy in hydraulic systems. Usually, parameters can be related to the health of the system and as such, deviations from the normal values of the parameters can be linked to developing faults. When the parameters cannot be measured directly using sensors, they need to be estimated. The EKF is a state and parameter estimation algorithm, which has recently been used for early fault detection in fluid power systems. In this paper, the EKF algorithm is described, and to illustrate the technique, it is applied to a simulated model of a simple mass spring damper system and then to a simulated model of a high performance hydrostatic system, the ElectroHydraulic Actuator (EHA). The EKF is used to estimate important parameters such as the spring constant and the viscous damping coefficient in the mass spring damper system and the effective bulk modulus in the hydrostatic system. Using simulation studies, the ability for the filter to detect and estimate changes in the parameters is investigated, In addition,

experimental results showing the estimation of the effective bulk modulus in the hydrostatic system is presented. The EKF is a viable tool for early fault detection in hydraulic systems.
Author
Fault Detection; Hydrostatics; Kalman Filters; Bulk Modulus; Estimating; Parameter Identification; State Estimation; Hydraulic Equipment; Actuators

32
COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and *17 Space Communications, Spacecraft Communications, Command and Tracking*; for search and rescue, see *03 Air Transportation and Safety*; and *16 Space Transportation and Safety*.

20060021725 Mitre Corp., Bedford, MA USA
Head-Up vs. Head-Down: Effects of Precision on Cue Effectiveness and Display Signaling
Yeh, Michelle; Merlo, James L; Wickens, Christopher D; Brandenburg, David L; Jan 2001; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAL01-96-2-0003
Report No.(s): AD-A447823; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447823; Avail.: CASI: A02, Hard-copy

Two experiments were conducted to investigate the attentional effects in the presentation of cueing symbology with the use of a helmet-mounted display (HMD) relative to a hand-held display and how reduced cue precision (experiment 1) and increased clutter (experiment 2) might modulate these effects. Participants were asked to detect, identify, and give azimuth information for targets hidden in terrain presented in the far domain (i.e., the world) while performing a monitoring task in the near domain (i.e., the display) using either a HMD or hand-held display. The results revealed overall cueing benefits in target detection performance with slight decrements when cue imprecision was greater than 7.5 degrees. More importantly, undertrust of the cueing data induced by decreased precision widened attention breadth on trials after the automation unexpectedly failed.
DTIC
Cues; Helmet Mounted Displays; Portable Equipment; Precision

20060021746 Science Applications International Corp., McLean, VA USA
Future Combat Model
Burgess, Gregg M; Jackson, Jack A; Jun 23, 2005; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447860; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447860; Avail.: CASI: A03, Hard-copy

SUMMARY: (1) FCM is being developed to analyze C4ISR contributions across a wide range of combat scenarios; (2) FCM is designed to incorporate: Effects Based Operations, Joint Functional Concepts, and Joint Integrating Concepts; (3) FCM is designed to support analyses that are responsive to decision demands and timelines; (4) FCM IOC Sept '05.
DTIC
Combat; Command and Control; Models; Simulation

20060021755 TRADOC Analysis Command, Fort Leavenworth, KS USA
Network Representation in Army Force-on-Force Models -Reducing the Risk of Irrelevance
Joles, Jeffery; Blechinger, Pam; Gorski, Bruce; Jun 21, 2005; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447875; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447875; Avail.: CASI: A03, Hard-copy

Presentation on network representation in Army Force-on-Force models and reducing the risk of irrelevance. Agenda includes: The importance of network modeling; Progress in Force-on-Force simulation models; Network modeling challenges; Example: The network data challenge; Overcoming the challenges.
DTIC
Communication Networks; Risk

20060022013 NASA Johnson Space Center, Houston, TX, USA

Growth in the Number of SSN Tracked Orbital Objects

Stansbery, Eugene G.; [2004]; 5 pp.; In English; 55th International Astronautical Congress, 4-8 Oct. 2004, Vancouver, Canada; Original contains color and black and white illustrations

Contract(s)/Grant(s): 090-28-AP

Report No.(s): IAC-04-IAA.5.12.1.03; No Copyright; Avail.: CASI: A01, Hardcopy

The number of objects in earth orbit tracked by the US Space Surveillance Network (SSN) has experienced unprecedented growth since March, 2003. Approximately 2000 orbiting objects have been added to the 'Analyst list' of tracked objects. This growth is primarily due to the resumption of full power/full time operation of the AN/FPS-108 Cobra Dane radar located on Shemya Island, AK. Cobra Dane is an L-band (23-cm wavelength) phased array radar which first became operational in 1977. Cobra Dane was a 'Collateral Sensor' in the SSN until 1994 when its communication link with the Space Control Center (SCC) was closed. NASA and the Air Force conducted tests in 1999 using Cobra Dane to detect and track small debris. These tests confirmed that the radar was capable of detecting and maintaining orbits on objects as small as 5-cm diameter. Subsequently, Cobra Dane was reconnected to the SSN and resumed full power/full time space surveillance operations on March 4, 2003. This paper will examine the new data and its implications to the understanding of the orbital debris environment and orbital safety.

Author

Communication Networks; Earth Orbits; Phased Arrays; Cobra Dane (Radar); Space Debris

20060022533 NASA Johnson Space Center, Houston, TX, USA

UWB Technology and Applications on Space Exploration

Ngo, Phong; Phan, Chau; Gross, Julia; Dusl, John; Ni, Jianjun; Rafford, Melinda; [2006]; 23 pp.; In English; AIAA Annual Technical Symposium (ATS) 2006, 19 May 2006, Houston, TX, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Ultra-wideband (UWB), also known as impulse or carrier-free radio technology, is one promising new technology. In February 2002, the Federal Communications Commission (FCC) approved the deployment of this technology. It is increasingly recognized that UWB technology holds great potential to provide significant benefits in many terrestrial and space applications such as precise positioning/tracking and high data rate mobile wireless communications. This talk presents an introduction to UWB technology and some applications on space exploration. UWB is characterized by several uniquely attractive features, such as low impact on other RF systems due to its extremely low power spectral densities, immunity to interference from narrow band RF systems due to its ultra-wide bandwidth, multipath immunity to fading due to ample multipath diversity, capable of precise positioning due to fine time resolution, capable of high data rate multi-channel performance. The related FCC regulations, IEEE standardization efforts and industry activities also will be addressed in this talk. For space applications, some projects currently under development at NASA Johnson Space Center will be introduced. These include the UWB integrated communication and tracking system for Lunar/Mars rover and astronauts, UWB-RFID ISS inventory tracking, and UWB-TDOA close-in high resolution tracking for potential applications on robonaut.

Author

Bandwidth; Broadband; Radio Frequencies; Wireless Communication; Multipath Transmission; Mobile Communication Systems

20060022534 NASA Johnson Space Center, Houston, TX, USA

UWB Two-Cluster AOA Tracking Prototype System Design

Ngo, Phong H.; Arndt, D.; Phan, C.; Gross, J.; Jianjun; Rafford, Melinda; [2006]; 19 pp.; In English; AIAA Annual Technical Symposium (ATS) 2006, 19 May 2006, Houston, TX, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

This presentation discusses a design effort for a prototype ultra-wideband (UWB) tracking system that is currently under development at NASA Johnson Space Center (JSC). The system is being studied for use in tracking of lunar/Mars rovers during early exploration missions when satellite navigation systems are not available. The UWB technology is exploited to implement the tracking system due to its properties such as fine time resolution, low power spectral density and multipath immunity. A two cluster prototype design using commercially available UWB radios is employed to implement the Angle of Arrival (AOA) tracking methodology in this design effort. In order to increase the tracking range, low noise amplifiers (LNA) and high gain horns are used at the receiving sides. Field tests were conducted jointly with the Science and Crew Operation Utility Testbed (SCOUT) vehicle near the Meteor Crater in Arizona to test the tracking capability for a moving target in an operational environment. These tests demonstrate that the UWB tracking system can co-exist with other on-board radio

frequency (RF) communication systems (such as Global Positioning System (GPS), video, voice and telemetry systems), and that a tracking resolution less than 1% of the range can be achieved.
Author
Broadband; Prototypes; Systems Engineering; Tracking (Position); Cluster Analysis; Radio Communication

33
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment; and microelectronics and integrated circuitry. for related information see also *60 Computer Operations and Hardware*; and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar*.

20060021666 Sachs/Freeman Associates, Inc., Landover, MD USA
On the Modes and Loss Mechanisms of a High Q Mechanical Oscillator
Liu, Xiao; Morse, S F; Vignola, J F; Photiadis, D M; Sarkissian, A; Marcus, M H; Houston, B H; Mar 5, 2001; 4 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447714; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447714; Avail.: CASI: A01, Hardcopy

We have performed laser-Doppler vibrometry measurements of the vibration of a double-paddle oscillator. Seven modes with principally out-of-plane motion have been identified. Their resonance frequencies and mode shapes are in excellent agreement with three-dimensional finite element simulations. We have found that the second antisymmetric torsional mode has exceptionally good vibration isolation of its mode shape. This explains its extremely small low temperature internal friction below 10 K (2*10(exp -8). By correlating the internal friction of each mode with features of their mode shapes, a criterion has been established to develop high Q oscillators.
DTIC
Doppler Effect; Losses; Mechanical Oscillators; Microelectromechanical Systems; Oscillators; Q Factors; Vibration Meters

20060021667 California Inst. of Tech., Pasadena, CA USA
Submicron Systems Architecture Project
Chandy, K M; Mar 31, 1989; 17 pp.; In English
Contract(s)/Grant(s): N00014-87-K-0745; DARPA ORDER-6202
Report No.(s): AD-A447716; CALTECH-CS-TR-89-4; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447716; Avail.: CASI: A03, Hardcopy

The central theme of this research is the architecture and design of VLSI systems appropriate to a microcircuit technology scaled to submicron feature sizes. Our work is focused on VLSI architecture experiments that involve the design, construction, programming, and use of experimental message-passing concurrent computers, and includes related efforts in concurrent computation and VLSI design.
DTIC
Architecture (Computers); Very Large Scale Integration

20060021677 California Inst. of Tech., Pasadena, CA USA
The Design of an Asynchronous Microprocessor
Martin, Alain J; Burns, Steven M; Lee, T K; Borkovic, Drazen; Hazewindus, Pieter J; Jan 1989; 25 pp.; In English
Contract(s)/Grant(s): N00014-79-C-0597; N00014-87-K-0745
Report No.(s): AD-A447727; CALTECH-CS-TR-89-2; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447727; Avail.: CASI: A03, Hardcopy

Prejudices are as tenacious in science and engineering as in any other human activity. One of the most firmly held prejudices in digital VLSI design is that asynchronous circuits-a.k.a. self-timed or delay-insensitive circuits-are necessarily slow and wasteful in area and logic. Whereas asynchronous techniques would be appropriate for control, they would be inadequate for data paths because of the cost of dual-rail encoding of data, the cost of generating completion signals for write operations on registers, and the difficulty of designing self-timed buses. Because a general-purpose microprocessor contains a complex data path, a corollary of the previous opinion is that it is impossible to design an efficient asynchronous microprocessor. Since we have been developing a design method for asynchronous circuits that gives excellent results, and since the above objections to large-scale data path designs are genuine but untested, we decided to 'pick up the gauntlet' and

design a complete processor. The design of an asynchronous microprocessor poses new challenges and opens new avenues to the computer architect. Hence, the experiment unavoidably developed a dual purpose: We are refining an already well-tested design method and we are starting a new series of experiments in asynchronous architectures. (As far as we know, this is the first entirely asynchronous microprocessor ever built.) The results we are reporting have a different implication depending on whether they are related to the first or second goal of the experiment. Whereas we are convinced that our design methods have reached maturity, we are quite aware that asynchronous techniques may influence the computer architects in completely new ways that this first design is just starting to explore.
DTIC
Microprocessors; Synchronism; Very Large Scale Integration

20060021679 California Inst. of Tech., Pasadena, CA USA
Testing Delay-Insensitive Circuits
Martin, Alain J; Hazewindus, Pieter J; Jan 1990; 17 pp.; In English
Contract(s)/Grant(s): N00014-87-K-0745; DARPA ORDER-6202
Report No.(s): AD-A447730; CALTECH-CS-TR-90-17; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447730; Avail.: CASI: A03, Hardcopy

We show that a single stuck-at fault in a non-redundant delay-insensitive circuit results in a transition either not taking place or firing prematurely, or both, during an execution of the circuit. A transition not taking place can be tested easily, as this always prevents a transition on a primary output from taking place. A premature firing can also be tested but the addition of testing points may be required to enforce the premature firing and to propagate the transition to a primary output. Hence all single stuck-at faults are testable. All test sequences can be generated from the high-level specification of the circuit. The circuits are hazard-free in normal operation and during the tests.
DTIC
Circuits; Computer Systems Design; Delay Circuits; Fault Tolerance

20060021680 Naval Research Lab., Washington, DC USA
Thermoelastic Loss in Microscale Oscillators
Houston, B H; Photiadis, D M; Marcus, M H; Bucaro, J A; Liu, Xiao; Vignola, J F; Dec 19, 2001; 4 pp.; In English
Report No.(s): AD-A447731; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447731; Avail.: CASI: A01, Hardcopy

A simple model of thermoelastic dissipation is proposed for general, free standing microelectromechanical (MEMS) and nanoelectromechanical (NEMS) oscillators. The theory defines a flexural modal participation factor, the fraction of potential energy stored in flexure, and approximates the internal friction by assuming the energy loss to occur solely via classical thermoelastic dissipation of this component of the motion. The theory is compared to the measured internal friction of a high Q mode of a single-crystal silicon double paddle oscillator. The loss at high temperature (above 150 K) is found to be in good agreement with the theoretical prediction. The importance of this dissipation mechanism as a function of scale is briefly discussed. We find that the relative importance of this mechanism scales with the size of the structure, and that for nanoscale structures it is less important than intrinsic phonon phonon scattering.
DTIC
Losses; Microelectromechanical Systems; Nanostructures (Devices); Nanotechnology; Oscillators; Phonons; Thermoelasticity

20060021681 California Inst. of Tech., Pasadena, CA USA
Performance Analysis and Optimization of Asynchronous Circuits Produced by Martin Synthesis
Burns, Steven M; Jan 1990; 18 pp.; In English
Contract(s)/Grant(s): N00014-87-K-0745; DARPA ORDER-6202
Report No.(s): AD-A447732; CALTECH-CS-TR-90-12; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447732; Avail.: CASI: A03, Hardcopy

We present a method for analyzing the timing performance of asynchronous circuits, in particular, those derived by program transformation from concurrent programs using the synthesis approach developed by Martin. The analysis method produces a performance metric (related to the time needed to perform an operation) in terms of the primitive gate delays of the circuit. Because the gate delays are functions of transistor sizes, the performance metric can be optimized with respect to these sizes. For a large class of asynchronous circuits - including those produced by Martin synthesis - these techniques

produce the global optimum of the performance metric. A CAD tool has been implemented to perform this optimization.
DTIC
Circuits; Optimization; Reliability Analysis; Synchronism

20060021682 California Inst. of Tech., Pasadena, CA USA
Performance Analysis and Optimization of Asynchronous Circuits
Burns, Steven M; Martin, Alain J; Jan 1990; 18 pp.; In English
Contract(s)/Grant(s): N00014-87-K-0745; DARPA ORDER-6202
Report No.(s): AD-A447734; CALTECH-CS-TR-90-18; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447734; Avail.: CASI: A03, Hardcopy

We present a method for analyzing the time performance of asynchronous circuits, in particular, those derived by program transformation from concurrent programs using the synthesis approach developed by the second author. The analysis method produces a performance metric (related to the time needed to perform an operation) in terms of the primitive gate delays of the circuit. Such a metric provides a quantitative means by which to compare competing designs. Because the gate delays are functions of transistor sizes, the performance metric can be optimized with respect to these sizes. For a large class of asynchronous circuits-including those produced by using our synthesis method-these techniques produce the global optimum of the performance metric. A CAD tool has been implemented to perform this optimization.
DTIC
Circuits; Optimization; Reliability Analysis; Synchronism

20060021684 Naval Research Lab., Washington, DC USA
Use of Luminescent CdSe-ZnS Nanocrystal Bioconjugates in Quantum Dot-Based Nanosensors
Tran, P T; Goldman, E R; Anderson, G P; Mauro, J M; Mattoussi, H; Jan 2002; 7 pp.; In English
Contract(s)/Grant(s): N00014-01-WX-20854
Report No.(s): AD-A447736; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447736; Avail.: CASI: A02, Hardcopy

Biomolecules labeled with luminescent colloidal semiconductor quantum dots (QDs) have potential for use in numerous applications, including fluoro-immunoassays and biological imaging. QD labels exhibit size-tunable narrow-band luminescent emission and high resistance to photodegradation. They also exhibit efficient Fo rster energy transfer between neighboring QDs of different sizes and their emission is readily quenched by bound fluorescent dyes. In this paper, we describe preliminary results aimed at defining conditions for the design and preparation of nanoscale QD-bioconjugate sensors based on fluorescence quenching. We envision building sensor assemblies that employ quantum dots linked with dye-labeled biological receptors that utilize donor acceptor energy transfer between QDs and receptors for conducting recognition-based assays. In particular, we report the effects of varying the concentration of energy acceptors bound to nanocrystal surfaces under both soluble and solid phase conditions on quenching phenomena.
DTIC
Cadmium Selenides; Detectors; Luminescence; Nanocrystals; Quantum Dots; Zinc Sulfides

20060021685 California Inst. of Tech., Pasadena, CA USA
The Limitations to Delay-Insensitivity in Asynchronous Circuits
Martin, Alain J; Jan 1990; 19 pp.; In English
Contract(s)/Grant(s): N00014-87-K-0745; DARPA ORDER-6202
Report No.(s): AD-A447737; CALTECH-CS-TR-90-02; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447737; Avail.: CASI: A03, Hardcopy

Asynchronous techniques that is, techniques that do not use clocks to implement sequencing are currently attracting considerable interest for digital VLSI circuit design particularly when the circuits produced are delay-insensitive (DI). A digital circuit is DI when its correct operation is independent of the delays in operators and in the wires connecting the operators, except that the delays are finite and positive. In this paper, we characterize the class of circuits that are entirely DI, and we show that this class is surprisingly limited: Practically all circuits of interest fall outside the class since closed circuits inside the class may contain only C-elements as multiple-input operators. The paper is organized as follows: First, we introduce the stable gate model of DI circuits, which is based on the notion of production rules (PRs) as elementary computation steps. We then define a partial ordering on transitions in the circuits. We prove that all DI circuits have to fulfill the so-called Unique-Successor-Set criterion; and we show that the class of circuits that meet this criterion is very limited. We also give

a characterization of the class of computations that admit a DI implementation. Finally, we discuss what we consider to be the weakest compromise to delay-insensitivity, namely, isochronic forks.
DTIC
Circuits; Sensitivity; Synchronism

20060021688 California Inst. of Tech., Pasadena, CA USA
Asynchronous Circuits for Token-Ring Mutual Exclusion
Martin, Alain J; Jun 18, 1990; 12 pp.; In English
Contract(s)/Grant(s): N00014-87-K-0745; DARPA ORDER-6202
Report No.(s): AD-A447746; CALTECH-CS-TR-90-09; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447746; Avail.: CASI: A03, Hardcopy

We have described three algorithms for distributed mutual exclusion on a ring. All algorithms use a token to select a candidate. We have already implemented the most efficient of these algorithms as an asynchronous VLSI circuit. We are now going to implement the simplest one. An arbitrary number (\g 1) of cyclic automata, called 'masters,' make independent requests for exclusive access to a shared resource. The circuit should handle the requests from the masters in such a way that any request is eventually granted, and there is at most one master using the shared resource at any time. The masters are independent of each other: They do not communicate with each other, and the activity of a master not using the resource should not influence the activity of other masters. A master, M, communicates with its private server, m. When M wants to use the shared resource (M is said to be a candidate), it issues a request to m. When the request is accepted, M uses that resource (for a finite period of time), and then informs m that the resource is free again. The servers are connected in a ring. At any time, exactly one (arbitrary) server holds a 'privilege,' or 'token.' The token circulates continuously around the ring of servers, and only the server that holds the token may grant the resource to its master, which guarantees mutual exclusion on the access to the resource.
DTIC
Circuits; Client Server Systems; Exclusion; Synchronism

20060021693 Cornell Univ., Ithaca, NY USA
Shell-Type Micromechanical Actuator and Resonator
Zalalutdinov, Maxim; Aubin, Keith L; Reichenbach, Robert B; Zehnder, Alan T; Houston, Brian; Parpia, Jeevak M; Craighead, Harold G; Sep 2, 2003; 4 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DMR-0079992
Report No.(s): AD-A447757; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447757; Avail.: CASI: A01, Hardcopy

Dome-shaped radio-frequency micromechanical resonators were fabricated by utilizing the buckling of a prestressed thin polysilicon film. The enhanced rigidity of the dome structure leads to a significant increase of its resonant frequency compared to a flat plate resonator. The shell-type geometry of the structure also provides an imbedded actuation mechanism. Significant out-of plane deflections are actuated by mechanical stress introduced within the plane of the shell. We demonstrate that thermomechanical stress generated by a focused laser beam, or microfabricated resistive heater, provides an effective and fast mechanism to operate the dome as an acoustic resonator in the radio-frequency range. All-optical operation of the shell resonator and an integrated approach are discussed.
DTIC
Actuators; Microelectromechanical Systems; Micromechanics; Radio Frequencies; Resonant Frequencies; Resonators

20060021696 Gdansk Technical Univ., Poland
Determination of the Width of the Carrier Recombination Zone in Organic Light-Emitting Diodes
Kalinowski, J; Palilis, L C; Kim, W H; Kafafi, Z H; Sep 18, 2003; 5 pp.; In English
Report No.(s): AD-A447760; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447760; Avail.: CASI: A01, Hardcopy

Bilayer organic light-emitting diodes based on tris-(8-hydroxyquinolinato) aluminum III have been fabricated where the thickness of the light-emitting layer was varied between 10 and 80 nm while maintaining a constant total thickness of the organic layers. The electroluminescence quantum efficiency of the devices was measured as a function of the emitter thickness, and used to determine the width of the carrier recombination zone at different electric fields. The width of the carrier recombination zone is found to decrease with an increase in electric field [from 70 nm (E50.75 MV/cm) to 40 nm (E51.0

MV/cm)]. It is also related to the field-dependent carrier injection efficiency. An estimate of the light output coupling factor ~0.4! is also given based on this analysis.
DTIC
Electroluminescence; Emission; Light Emitting Diodes; Quantum Efficiency

20060021698 California Inst. of Tech., Pasadena, CA USA
Synthesis of Asynchronous VLSI Circuits
Martin, Alain J; Mar 22, 2000; 147 pp.; In English
Contract(s)/Grant(s): N00014-87-K-0745; DARPA ORDER-6202
Report No.(s): AD-A447762; CALTECH-CS-TR-93-28; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447762; Avail.: CASI: A07, Hardcopy

With chip size reaching one million transistors. the complexity of VLSI algorithms-i.e., algorithms implemented as a digital VLSI circuit-is approaching that of software algorithms i.e., algorithms implemented as code for a stored-program computer. Yet design methods for VLSI algorithms lag far behind the potential of the technology. Since a digital circuit is the implementation of a concurrent algorithm, we propose a concurrent programming approach to digital VLSI design. The circuit to be designed is first implemented as a concurrent program that fulfills the logical specification of the circuit. The program is then compiled manually or automatically-into a circuit by applying semantic-preserving program transformations. Hence, the circuit obtained is correct by construction. The main obstacle to such a method is finding an interface that provides a good separation of the physical and algorithmic concerns. Among the physical parameters of the implementation, timing is the most difficult to isolate from the logical design, because the timing properties of a circuit are essential not only to its real time behavior but also to its logical correctness if the usual synchronous techniques are used to implement sequencing. For this reason, delay. insensitive' techniques are particularly attractive for VLSI synthesis. A circuit is delay-insensitive when its correct operation is independent of any assumption on delays in operators and wires except that the delays be finite. Such circuits do not use a clock signal or knowledge about delays. Let us clarify a matter of definitions right away: It has been proved in that the class of entirely delay-insensitive circuits is very limited. Different asynchronous techniques distinguish themselves in the choice of the compromises to delay-insensitivity.
DTIC
Circuits; Integrated Circuits; Synchronism; Very Large Scale Integration

20060021714 Naval Ship Engineering Center, Washington, DC USA
The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 16: The Navy's Cabling and Wiring Computer Program
Mellis, James; Jun 1976; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447784; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447784; Avail.: CASI: A03, Hardcopy

In the mid 1960's the Computer Aided Ship Design and Construction project office, located in the Naval Ship Engineering Center, was chartered to apply computer aiding techniques to all phases of the naval shipbuilding process. After the aerospace industry's success in developing a productive wiring data system and an in-depth NAVSEC sponsored study at three designated naval shipyards of the cabling/wiring flow process during installation design, it was determined that a similar system should be developed for naval ship design and production. Because there are significant differences between wiring an aircraft and wiring a ship, a direct conversion from one application to the other was ruled out. In 1965 the Westinghouse Electric Corporation was selected to develop a system of computer programs for processing the flow of electrical and electronic cabling/wiring information used in ship construction. This system was to address the entire process of installation design of equipment on board any Navy ship. This included,such functions as cable routing, hanger selection, penetration design, planning and estimating supporting documents and the equivalent of all the necessary wiring plans. The C/W System is now being implemented at Norfolk and Long Beach and is scheduled for implementation in the other naval shipyards. This system is the first of what the author hopes will be a large number of computer aided ship design and construction programs to be developed and implemented by the Naval Sea Systems Command. It is expected that by applying these systems deliberately and diligently in an integrated shipyard modernization program, the total benefits of electronic data processing can be obtained, thus producing a better ship faster and at a lower cost.
DTIC
Computer Aided Design; Computer Programs; Conferences; Marine Technology; Ships; Wiring

20060021728 Micro-Optics Technologies, Inc., Middleton, WI USA

Optically Driven Wireless Earplug for Communications and Hearing Protection

Buchholz, Jeffrey; Klusmeyer, Toby; Janousek, James; Wilt, James; Oct 2005; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447826; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447826; Avail.: CASI: A02, Hardcopy

Electronic earplugs with embedded receivers provide for quality communications capability and effective double hearing protection in high noise environments. With the addition of ear canal microphones in the earplug greater hearing protection can be achieved using active noise reduction (ANR) in the ear canal. Current communication earplugs must be connected by wire to the outside world or must carry an onboard power source. The wire connection makes don and doff difficult, and presents a snag hazard and the connectors and wires pose possible problems in high EMI and EMP environments. Batteries in the earplug cause maintainability issues. The optically driven earplug described in this work eliminates the need for wire interconnects and earplug battery energy sources. Both the power to drive the earplug electronics and signals to and from the earplug are delivered optically through a free-space optical link to the outer layer of the double hearing protection. The optically driven earplug has been demonstrated to match the performance of a wire interconnect in both a listen-only earplug configuration and in two-way communication earplugs that can include ear canal Active Noise Reduction (ANR) with the addition of an ear canal microphone also driven through the optical interconnect.

DTIC

Ear Protectors; Wireless Communication

20060021740 Sachs/Freeman Associates, Inc., Crofton, MD USA

Evaluation and Characterization of Electro-Optic Components

McDermitt, Christopher S; Bucholtz, Frank; Mar 6, 2006; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447847; NRL/MR/5650--06-8939; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447847; Avail.: CASI: A03, Hardcopy

Mach-Zehnder modulators and optical switches are essential components in photonics links. This report provides an understanding of how external variables such as optical power, RF power, wavelength, and temperature independently affect the performance of these devices. For applications involving wide-temperature fluctuations, EO Space modulator AX-OK1-20-PFU-SFU-S will provide superior performance. However, for multiple wavelength applications, this advantage is mitigated by a quadrature bias drift of 0.35 volts per 10 nm. While modulator AZ-1x2-OK1-12-PFU-PFU functions independent of wavelength, the adverse temperature dependence is severe. In comparing the SW-1x2-SO-PFU-PFU and SW-1x2-P1-SFU-SFU optical switches, the pm-fiber switch provided an additional 10 dB of cross-talk suppression. Furthermore, the pm-fiber switch has a smaller differential switching voltage required to optimize the power back and forth between output channels.

DTIC

Electro-Optics; Optical Switching

20060021822 Army Research Lab., Adelphi, MD USA

Gray-Scale Lithography for MEMS Applications

Waits, Christopher M; Ghodssi, Reza; Dubey, Madan; Jan 2006; 3 pp.; In English

Report No.(s): AD-A447924; No Copyright; Avail.: CASI: A01, Hardcopy

Micro-electro-mechanical systems (MEMS) fabrication technologies originated directly from integrated circuit (IC) fabrication. IC devices require only two-dimensional or planar structures to be fabricated because there are no mechanical operations taking place. Therefore, structures fabricated for MEMS devices have been traditionally designed with nominally vertical sidewalls (anisotropic etching), undercut sidewalls (wet isotropic etching), or sidewalls that have limited angles due to the crystallographic orientation of the substrate (wet anisotropic etching). A three-dimensional (3-D) structure in this paper pertains to arbitrarily sloped sidewalls in silicon. That is, a sidewall fabricated as vertical or sloped with a desired angle or profile. A 3-D technique could enhance the efficiency, reliability, and overall performance of various power MEMS devices. Such enhancements could be nozzle and diffuser elements in fluidic devices, trenches designed with specific sidewall profiles for ball bearing devices, and aerodynamic structures for rotary applications. A technique called gray-scale lithography is applied using a one-level development process to create 3-D structures in photoresist. This technique utilizes planar processing and provides additional flexibility that is not supported in conventional IC fabrication technologies. The key components for the development of MEMS-based gray-scale lithography are presented.

DTIC

Fabrication; Gray Scale; Lithography; Microelectromechanical Systems; Photolithography

20060021833 Army Research Lab., Aberdeen Proving Ground, MD USA
Communication Strategies for Shared-Bus Embedded Multiprocessors
Bambha, Neal K; Sep 2005; 5 pp.; In English
Report No.(s): AD-A447942; No Copyright; Avail.: CASI: A01, Hardcopy

This paper explores the problem of efficiently ordering interprocessor communication operations in both statically and dynamically-scheduled multiprocessors for iterative dataflow graphs with probabilistic execution times. In most digital signal processing applications, the throughput of the system is significantly affected by communication costs. We explicitly model these costs within an effective graph-theoretic analysis framework. We show that ordered transaction schedules can significantly outperform both self-timed schedules and dynamic schedules for moderate task execution time variability. As the task execution time variability increases, we show that first selftimed and then dynamic scheduling policies are preferred. We perform an extensive experimental comparison on both real and simulated benchmarks to gauge the effect of synchronization and communication overhead costs on these crossover points.
DTIC
Embedding; Interprocessor Communication; Multiprocessing (Computers); Time Sharing; Very Large Scale Integration

20060021835 Library of Congress, Washington, DC USA
Digital Surveillance: The Communications Assistance for Law Enforcement Act
Moloney Figliola, Patricia; May 3, 2005; 17 pp.; In English
Report No.(s): AD-A447945; No Copyright; Avail.: CASI: A03, Hardcopy

The Communications Assistance for Law Enforcement Act {CALEA, P. L. 103-414, 47 USC 1001-1010}, enacted October 25, 1994, is intended to preserve the ability of law enforcement officials to conduct electronic surveillance effectively and efficiently despite the deployment of new digital technologies and wireless services that have altered the character of electronic surveillance. CALEA requires telecommunications carriers to modify their equipment, facilities, and services, wherever reasonably achievable, to ensure that they are able to comply with authorized electronic surveillance actions.
DTIC
Digital Systems; Electronic Equipment; Law (Jurisprudence); Pulse Communication; Surveillance

20060021883 Gratings, Inc., Albuquerque, NM USA
Mobility and Transverse Electric Field Effects in Channel Conduction of Wrap-Around-Gate Nanowire MOSFETs
Sharma, A K; Zaidi, S H; Lucero, S; Brueck, S R; Islam, N E; Jan 2004; 10 pp.; In English
Contract(s)/Grant(s): Proj-4846
Report No.(s): AD-A448034; No Copyright; Avail.: CASI: A02, Hardcopy

The current conduction process through a nanowire wrap-around-gate, ~50 nm channel diameter, silicon MOSFET has been investigated and compared with a ~2 mum wide slab, ~200 nm thick silicon (SOI) top-only-gate planar MOSFET with otherwise similar doping profiles, gate length and gate oxide thickness. The experimental characteristics of the nanowire and planar MOSFETs were compared with theoretical simulation results based on semiempirical carrier mobility models. The SOI nanowire MOS devices were fabricated through interferometric lithography in combination with conventional I-line lithography. A significant increase (~3) in current density was observed in the nanowire devices compared to the planar devices. A number of parameters such as carrier confinement, effects of parallel and transverse field-dependent mobilities, and carrier scattering due to Coulomb effects, acoustic phonons, impurity doping profile and surface roughness influences the transport process in the channel regions. The electron mobility in the nanochannel increases to ~1200 cm2/V s compared to ~400 cm2/V s for a wide slab planar device of similar channel length. Experiments also show that the application of the channel potential from three sides in the nanowire structure dramatically improves the subthreshold slope characteristics.
DTIC
Electric Fields; Field Effect Transistors; Metal Oxide Semiconductors; Mobility; Nanowires; Semiconductors (Materials)

20060021895 Maryland Univ., College Park, MD USA
Interconnect Synthesis for Systems on Chip
Bambha, Neal K; Bhattacharyya, Shuvra S; Jul 2004; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): MDA972-00-1-0023
Report No.(s): AD-A448078; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We describe an algorithm for performing a joint scheduling/ interconnect synthesis optimization for System-on-Chip (SoC) architectures. The algorithm is able to account for different distributions of long vs. short interconnect routes in an

architecture. It is based on a genetic algorithm, and utilizes a graph isomorphism test to significantly pare the search space and increase the search efficiency.
DTIC
Architecture (Computers); Chips; Topology

20060021975 Sandia National Labs., Albuquerque, NM USA
High-G Testing of MEMS Mechanical Non-Volatile Memory and Silicon Re-Entry Switch
Baker, M. S.; Pohl, K. R.; Oct. 2005; 20 pp.; In English
Report No.(s): DE2006-875630; SAND2005-6094; No Copyright; Avail.: Department of Energy Information Bridge

Two different Sandia MEMS devices have been tested in a high-g environment to determine their performance and survivability. The first test was performed using a drop-table to produce a peak acceleration load of 1792 g's over a period of 1.5 ms. For the second test the MEMS devices were assembled in a gun-fired penetrator and shot into a cement target at the Army Waterways Experiment Station in Vicksburg Mississippi. This test resulted in a peak acceleration of 7191 g's for a duration of 5.5 ms. The MEMS devices were instrumented using the MEMS Diagnostic Extraction System (MDES), which is capable of driving the devices and recording the device output data during the high-g event, providing in-flight data to assess the device performance. A total of six devices were monitored during the experiments, four mechanical non-volatile memory devices (MNVM) and two Silicon Reentry Switches (SiRES). All six devices functioned properly before, during, and after each high-g test without a single failure. This is the first known test under flight conditions of an active, powered MEMS device at Sandia.
NTIS
Microelectromechanical Systems; Performance Tests; Reentry; Silicon; Switches

20060021980 NASA Glenn Research Center, Cleveland, OH, USA
Design and Development of a CPCI-Based Electronics Package for Space Station Experiments
Kolacz, John S.; Clapper, Randy S.; Wade, Raymond P.; May 2006; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 805-01-03
Report No.(s): NASA/TM-2006-214334; E-15567; No Copyright; Avail.: CASI: A03, Hardcopy

The NASA John H. Glenn Research Center is developing a Compact-PCI (CPCI) based electronics package for controlling space experiment hardware on the International Space Station. Goals of this effort include an easily modified, modular design that allows for changes in experiment requirements. Unique aspects of the experiment package include a flexible circuit used for internal interconnections and a separate enclosure (box in a box) for controlling 1 kW of power for experiment fuel heating requirements. This electronics package was developed as part of the FEANICS (Flow Enclosure Accommodating Novel Investigations in Combustion of Solids) mini-facility which is part of the Fluids and Combustion Facility s Combustion Integrated Rack (CIR). The CIR will be the platform for future microgravity combustion experiments and will reside on the Destiny Module of the International Space Station (ISS). The FEANICS mini-facility will be the primary means for conducting solid fuel combustion experiments in the CIR on ISS. The main focus of many of these solid combustion experiments will be to conduct applied scientific investigations in fire-safety to support NASA s future space missions. A description of the electronics package and the results of functional testing are the subjects of this report. The report concludes that the use of innovative packaging methods combined with readily available COTS hardware can provide a modular electronics package which is easily modified for changing experiment requirements.
Author
Electronic Modules; International Space Station; Spaceborne Experiments; Electronic Packaging

20060021981 NASA Glenn Research Center, Cleveland, OH, USA
Modeling of the Near Field Coupling Between an External Loop and an Implantable Spiral Chip Antennas in Biosensor Systems
Simons, Rainee N.; Miranda, Felix A.; May 2006; 11 pp.; In English; 2006 Joint International Symposium, 9-14 Jul. 2006, Albuquerque, NN, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 22-252-92-80
Report No.(s): NASA/TM-2006-214337; E-15573; No Copyright; Avail.: CASI: A03, Hardcopy

In this paper, the near field coupling between an external hand-held loop antenna and an implantable miniature (1x1 mm) printed square spiral chip antenna used in bio-MEMS sensors for contact-less powering and RF telemetry is investigated. The loop and the spiral are inductively coupled and effectively form a transformer. The numerical results include the

quasi-stationary magnetic field pattern of the implanted antenna, near zone wave impedance as a function of the radial distance and the values of the lumped elements in the equivalent circuit model for the transformer.
Author
Bioinstrumentation; Mathematical Models; Near Fields; Loop Antennas; Spiral Antennas; Chips (Electronics); Microelectromechanical Systems

20060022082 NASA Johnson Space Center, Houston, TX, USA
Experimental Partitioning of Cr(3+) and Sc(3+) into Olivine: Mechanisms and Implications
Jones, John; Mackwell, S. J.; [2006]; 1 pp.; In English; 19th General Meeting of the International Mineralogical Association, 23-28 Jul. 2006, Kobe, Japan; No Copyright; Avail.: Other Sources; Abstract Only

Olivine (Mg, Fe)Si2O4 does not, by stoichiometry, accept cations such as Sc(3+) or Cr(3+). However, the partition coefficients of Sc and Cr between olivine and liquid are significant 0.2-1.0. We have measured Cr(3+) partition coefficients of near unity and have grown olivines with nearly 3 wt.% Sc2O3. Therefore, there must be a simple means of charge balancing 3+ ions in a crystal structure that was obviously not designed to receive other than 2+ ions on the olivine M sites. The simplest explanation is that two 3+ ions enter the olivine structure by displacing three 2+ ions and creating an M site vacancy. Even this explanation has difficulties. For minor elements in our experiments (~1 wt.%) the odds of a minor element 3+ ion finding a second 3+ for charge balance are of the order of 100:1 against. Because of the reducing conditions of our experiments, Fe(3+) will not suffice; and Al(3+) is not in sufficient quantity in olivine for charge balance. Therefore, Cr or Sc must, in effect, charge balance itself. For true trace elements, the problem is compounded many times. For an ion at the 10 ppm level the chances of finding a second (for example) Sc ion is approx.10(exp 5):1 against. Of course, any other 3+ ion would suffice but comparisons between percent level doping experiments and trace level partitioning indicate that Henry s law is obeyed. This implies that the same substitution mechanism occurs at both the percent and tens of ppm levels. There are two simple solutions to this problem: (i) The electrical conductivity of olivine is such that charge balance need not be local. This requires substantial domains within the olivine crystal in electrical contact by migration of vacancies or electronic defects. (ii) The 3+ cation brings along its own charge-balancing ion because it existed as a dimer in the silicate liquid. Olivine is not a true insulator but is actually a p-type semiconductor. Even so, electrical communication by this means is unlikely over the tens or hundreds of unit cells that would be required for charge balance to be local. Therefore, we cautiously favor the idea that melt speciation is the means by which 3+ ions enter the olivine structure. Possibly this model might be tested by in situ XAFS measurements or by molecular dynamical calculations.
Author
Olivine; Stoichiometry; Cations; Molecular Dynamics; Crystal Structure; Trace Elements; Silicates; Insulators

20060022547 NASA Langley Research Center, Hampton, VA, USA
Statistical of a Characterization and the Simulation of a Reverberation Chamber Using Finite-Element Techniques
Bunting, Charles F.; IEEE Transactions on Electromagnetic Compatability; [2006]; Volume 44, No.1, pp. 214-221; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC1-01-32; NAG1-1982; Copyright; Avail.: Other Sources

The statistical characterization of a simulation reverberation chamber is performed by considering a two-dimensional finite element model. This model includes a source to study the particular modal fields that couple into either a transverse electric or transverse magnetic configuration. The analysis includes a characterization of the basic field statistics, max-to-average ratio, normalized standard deviation, stirring ratio, and field uniformity. The shielding effectiveness of an aperture will be studied that will provide some insight into the nature of the fields coupled from a complex to a noncomplex environment.
Author
Finite Element Method; Reverberation Chambers; Statistical Analysis; Electromagnetic Compatibility; Computerized Simulation; Mathematical Models

20060022714 Sandia National Labs., Albuquerque, NM USA, Wisconsin Univ., Madison, WI, USA
Results of External Review Sandia Microelectronics and Microsystems Program (September 2004)
Peercy, P. S.; Myers, D. R.; Aug. 2005; 34 pp.; In English
Report No.(s): DE2006-876290; SAND2005-2327; No Copyright; Avail.: Department of Energy Information Bridge

The US Department of Energy requires a periodic assessment of the Microsystems Program at Sandia National Laboratories. An external review of this program is held approximately every 18 months to 24 months. The report from the

External Review Panel serves as the basis for Sandia's self assessment and is a specific deliverable of the governance contract between Lockheed Martin and the Department of Energy. The External Review of Microelectronics and Microsystems for Fiscal Year 2004 was held September 27-29, 2004 at Sandia National Laboratories, Albuquerque, NM. The external review panel consisted of experts in the fields of microelectronics, photonics and microsystems from universities, industry and other Government agencies. A complete list of the panel members is included as Appendix A of the attached report. The review assessed four areas: relevance to national needs and agency mission; quality of science, technology and engineering; performance in the operation of a major facility; and program performance management and planning.
NTIS
Laboratories; Microelectronics

20060022726 NASA Langley Research Center, Hampton, VA, USA
Shielding Effectiveness of Metallic Enclosures at Oblique and Arbitrary Polarizations
Deshpande, Manohar D.; Khan, Zulfiqar Ali; Bunting, Charles F.; IEEE Transactions on Electromagnetic Compatibility; [2006]; ISSN 0018-9375; Vol. 47, No. 1, pp. 112-122; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC1-01032; Copyright; Avail.: Other Sources

Shielding effectiveness of metallic enclosures with apertures when illuminated by an oblique incidence arbitrary polarized plane wave has been studied by using an efficient hybrid modal/moment technique. Shielding effectiveness of rectangular enclosures with one, two, and four apertures at multiple points inside the enclosures for various frequencies has been calculated when the illuminating source flies by the front of the enclosure. The work shows that the shielding effectiveness is seriously affected by frequency, angle of incidence and polarization of the illuminating field; the number and orientation of apertures; and the location inside the cavity. It has been shown that the usual assumption about the normal incidence being the worst-case scenario for shielding effectiveness values may not be valid when there is more than one aperture in the cavity. The paper emphasizes the need for the statistical investigation of shielding effectiveness problem of metallic enclosures with apertures.
Author
Polarization; Statistical Analysis; Obliqueness; Enclosure; Metal Surfaces; Electromagnetic Shielding

34
FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics*.

20060021817 Princeton Univ., NJ USA
An Experimental Study of Shock/Turbulent Boundary Layer Interactions at DNS Accessible Reynolds Numbers
Bookey, Patrick B; May 2005; 147 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-02-1-0361
Report No.(s): AD-A447916; 3134-T; No Copyright; Avail.: CASI: A07, Hardcopy

An investigation was conducted to study four shock/turbulent boundary layer interactions. In Mach 2.9 flow, a 24 compression corner and a 12 reflected shock interaction were studied at Reynolds number based on momentum thickness = 2400. In Mach 8 flow, an 8 compression corner and a 10 sharp fin were studied at Reynolds number based on momentum thickness = 3500. The flow was examined through the use of surface oil flow visualization, surface pressure measurements, mean Pitot pressure and total temperature surveys and condensate-enhanced filtered Rayleigh scattering (FRS). The combination of these experimental techniques allowed the determination of velocity profiles, separation and reattachment points, mean surface pressure distribution, key surface features and provided information on the large-scale structures in the boundary layer through the shock interactions. The 24 compression corner interaction at Mach 2.9 produced a fully separated flow with the characteristic lengths of separation and mean pressure distribution significantly different than those of higher Reynolds numbers. The FRS images revealed a highly unsteady separation shock that was disturbed by passing large structures. The organized structures showed very little change through the interaction. The 12 reflected shock interaction produced the characteristics of a fully separated flow, with the height of the separation bubble on the order of the incoming boundary layer height. The point of intersection of the incident and separation shocks was unsteady. The 8 compression corner at Mach 8 was found to remain attached from surface oil flow visualizations, contrary to expectations. The shock wave was deeply entrained in the boundary layer and was highly distorted by passing large turbulent structures for several boundary

layer thicknesses downstream of the corner. The 10 sharp fin interaction revealed the quasiconical symmetry of this type of interaction.
DTIC
Direct Numerical Simulation; Reynolds Number; Shock Layers; Turbulent Boundary Layer

20060021908 Duke Univ., Durham, NC USA
Large-Bandwidth Phase-Locked Measurements for High-Speed Flow Experiments with Controlled Disturbance Inputs
Chokani, Ndaona; Jul 2005; 25 pp.; In English
Contract(s)/Grant(s): FA95550-04-1-0397
Report No.(s): AD-A448110; No Copyright; Avail.: CASI: A03, Hardcopy

The purpose of the present work is to develop an experimental apparatus that will enable us to accurately detect, and then measure, the phase-locked interactions that occur in high-speed flows. In particular, we examine the structure of the shockwave/boundary layer interaction induced by an unswept compression ramp flow in the Supersonic Low Disturbance Wind Tunnel at the NASA Langley Research Center. SLDT has a unique capability for generating a very low disturbance environment with a free-stream noise level that is at least an order of magnitude lower than in conventional facilities. This low level of natural free-stream disturbances is advantageous for the generation of controlled free-stream disturbances with an acoustic generator. Measurement of the fluctuating density gradients are performed using a focusing schlieren deflectometer, which is a promising technique for large-bandwidth, phase-locked measurements in high-speed flows.
DTIC
Bandwidth; Boundary Layers; Free Flow; High Speed; Navier-Stokes Equation; Particle Image Velocimetry; Phase Locked Systems; Turbulent Flow

20060022120 NASA Langley Research Center, Hampton, VA, USA
Control of Supersonic Boundary Layers Using Steady Suction
Balakumar, P.; [2006]; 16 pp.; In English; 36th AIAA Fluid Dynamics Conference and Exhibit, 5-8 Jun. 2006, San Francisco, CA, USA; No Copyright; Avail.: CASI: A03, Hardcopy

Control of supersonic boundary layers using steady suction through a series of very small two-dimensional strips is numerically investigated at a free stream Mach number of 1.8. The mean flow induced by rows of suction holes is also computed. Both the steady and unsteady solutions are obtained by solving the full Navier-Stokes equations using the 5th-order accurate weighted essentially non-oscillatory (WENO) scheme for space discretization and using third-order total-variationdiminishing (TVD) Runge-Kutta scheme for time integration. Computations for the two-dimensional cases are performed at suction coefficients 0.001 and 0.002 to investigate the stabilizing effects of suction. The simulation showed that a series of shock waves are generated at the slots. The stability results showed that the total amplification is reduced up to the end of the computational domain. However, the growth rates become larger at downstream distances away from the suction region. The computations for the suction holes showed the generation of Mach waves from each hole and the formation of longitudinal vortices.
Author
Stability; Suction; Supersonic Boundary Layers; Steady Flow; Controllers

20060022122 NASA Langley Research Center, Hampton, VA, USA
Computational Analysis of Dual Radius Circulation Control Airfoils
Lee-Rausch, E. M.; Vatsa, V. N.; Rumsey, C. L.; [2006]; 18 pp.; In English; 36th AIAA Fluid Dynamics Conference and Exhibit, 5-8 Jun. 2006, San Francisco, CA, USA
Contract(s)/Grant(s): WBS 581-02-08-07
Report No.(s): AIAA Paper 2006-3012; No Copyright; Avail.: CASI: A03, Hardcopy

The goal of the work is to use multiple codes and multiple configurations to provide an assessment of the capability of RANS solvers to predict circulation control dual radius airfoil performance and also to identify key issues associated with the computational predictions of these configurations that can result in discrepancies in the predicted solutions. Solutions were obtained for the Georgia Tech Research Institute (GTRI) dual radius circulation control airfoil and the General Aviation Circulation Control (GACC) dual radius airfoil. For the GTRI-DR airfoil, two-dimensional structured and unstructured grid computations predicted the experimental trend in sectional lift variation with blowing coefficient very well. Good code to code comparisons between the chordwise surface pressure coefficients and the solution streamtraces also indicated that the detailed flow characteristics were matched between the computations. For the GACC-DR airfoil, two-dimensional structured and

unstructured grid computations predicted the sectional lift and chordwise pressure distributions accurately at the no blowing condition. However at a moderate blowing coefficient, although the code to code variation was small, the differences between the computations and experiment were significant. Computations were made to investigate the sensitivity of the sectional lift and pressure distributions to some of the experimental and computational parameters, but none of these could entirely account for the differences in the experimental and computational results. Thus, CFD may indeed be adequate as a prediction tool for dual radius CC flows, but limited and difficult to obtain two-dimensional experimental data prevents a confident assessment at this time.
Author
Circulation Control Airfoils; Computational Fluid Dynamics; Radii; Aerodynamic Configurations; General Aviation Aircraft

20060022152 NASA Langley Research Center, Hampton, VA, USA
Shuttle Damage/Repair from the Perspective of Hypersonic Boundary Layer Transition - Experimental Results
Horvath, Thomas J.; Berry, Scott A.; Merski, N. Ronald; Berger, Karen T.; Buck, Gregory M.; Liechty, Derek S.; Schneider, Steven P.; 2006; 22 pp.; In English; 9th AIAA/ASME Joint Thermophysics and Heat Transfer Conference, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 759-07-05
Report No.(s): AIAA Paper 2006-2919; Copyright; Avail.: CASI: A03, Hardcopy

An overview is provided of the experimental wind tunnel program conducted at the NASA Langley Research Center Aerothermodynamics Laboratory in support of an agency-wide effort to prepare the Shuttle Orbiter for Return-to-Flight. The effect of an isolated protuberance and an isolated rectangular cavity on hypersonic boundary layer transition onset on the windward surface of the Shuttle Orbiter has been experimentally characterized. These experimental studies were initiated to provide a protuberance and cavity effects database for developing hypersonic transition criteria to support on-orbit disposition of thermal protection system damage or repair. In addition, a synergistic experimental investigation was undertaken to assess the impact of an isolated mass-flow entrainment source (simulating pyrolysis/outgassing from a proposed tile repair material) on boundary layer transition. A brief review of the relevant literature regarding hypersonic boundary layer transition induced from cavities and localized mass addition from ablation is presented. Boundary layer transition results were obtained using 0.0075-scale Orbiter models with simulated tile damage (rectangular cavities) of varying length, width, and depth and simulated tile damage or repair (protuberances) of varying height. Cavity and mass addition effects were assessed at a fixed location (x/L = 0.3) along the model centerline in a region of near zero pressure gradient. Cavity length-to-depth ratio was systematically varied from 2.5 to 17.7 and length-to-width ratio of 1 to 8.5. Cavity depth-to-local boundary layer thickness ranged from 0.5 to 4.8. Protuberances were located at several sites along the centerline and port/starboard attachment lines along the chine and wing leading edge. Protuberance height-to-boundary layer thickness was varied from approximately 0.2 to 1.1. Global heat transfer images and heating distributions of the Orbiter windward surface using phosphor thermography were used to infer the state of the boundary layer (laminar, transitional, or turbulent). Test parametrics include angles-of-attack of 30 deg and 40 deg, sideslip angle of 0 deg, freestream Reynolds numbers from 0.02x106 to 7.3x106 per foot, edge-to-wall temperature ratio from 0.4 to 0.8, and normal shock density ratios of approximately 5.3, 6.0, and 12 in Mach 6 air, Mach 10 air, and Mach 6 CF4, respectively. Testing to simulate the effects of ablation from a proposed tile repair concept indicated that transition was not a concern. The experimental protuberance and cavity databases highlighted in this report were used to formulate boundary layer transition correlations that were an integral part of an analytical process to disposition observed Orbiter TPS damage during STS- 114.
Author
Angle of Attack; Boundary Layer Transition; Cavities; Reynolds Number; Space Shuttle Orbiters; Thermal Protection; Wind Tunnel Tests; Hypersonic Boundary Layer

20060022161 NASA Langley Research Center, Hampton, VA, USA
Shuttle Return To Flight Experimental Results: Cavity Effects on Boundary Layer Transition
Liechty, Derek S.; Horvath, Thomas J.; Berry, Scott A.; June 2006; 146 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 759-07-05
Report No.(s): NASA/TM-2006-214305; L-19256; No Copyright; Avail.: CASI: A07, Hardcopy

The effect of an isolated rectangular cavity on hypersonic boundary layer transition of the windward surface of the Shuttle Orbiter has been experimentally examined in the Langley Aerothermodynamics Laboratory in support of an agency-wide effort to prepare the Shuttle Orbiter for return to flight. This experimental study was initiated to provide a cavity effects database for developing hypersonic transition criteria to support on-orbit decisions to repair a damaged thermal protection system. Boundary layer transition results were obtained using 0.0075-scale Orbiter models with simulated tile damage

(rectangular cavities) of varying length, width, and depth. The database contained within this report will be used to formulate cavity-induced transition correlations using predicted boundary layer edge parameters.
Author
Space Transportation System Flights; Hypersonic Boundary Layer; Aerothermodynamics; Cavities; Thermal Protection; Damage; Space Shuttle Orbiters

20060022183 NASA Langley Research Center, Hampton, VA, USA
The Design of a High-Q, MACH-5 Nozzle for the Langley 8-Foot HTT
Gaffey, Richard L., Jr.; Stewart, Brian K.; Harvin, Stephen F.; [2006]; 17 pp.; In English; 25th AIAA Aerodynamic Measurement Technology and Ground Testing Conference, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 489-02-07-07
Report No.(s): AIAA Paper 2006-2954; Copyright; Avail.: CASI: A03, Hardcopy

A new nozzle has ben designed for the NASA Langley Research Center 8-Foot High Temperature Tunnel. The new nozzle was designed with a Mach-5 exit flow at a Mach-5 flight-enthalpy test condition and has a smaller throat area than the existing Mach-5 nozzle which significantly increases the range of dynamic pressures that can be achieved in the facility. The nozzle was designed using the NASA Langley IMOCND computer program which solves the potential equation using the classical method of characteristics. Several axisymmetric nozzle contours were generated and evaluated using viscous computational fluid dynamics. A number of items were considered in the evaluation, including flow uniformity, thermal and structural design, manufacturing schedule and cost. Once the final contour was selected, studies were done to determine the effects of manufacturing irregularities (steps and cavities at joints). These studies were done to develop manufacturing specifications and assembly tolerances.
Author
Q Factors; Hypersonic Wind Tunnels; Wind Tunnel Tests; X-43 Vehicle; Nozzle Design; Hypersonic Nozzles; Computational Fluid Dynamics; Mach Number

20060022185 NASA Langley Research Center, Hampton, VA, USA
A Wireless Fluid-Level Measurement Technique
Woodard, Stanley E.; Taylor, Bryant D.; January 06, 2006; 34 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 259-02-07-07
Report No.(s): NASA/TM-2006-214320; L-19271; No Copyright; Avail.: CASI: A03, Hardcopy

This paper presents the application of a recently developed wireless measurement acquisition system to fluid-level measurement. This type of fluid-level measurement system alleviates many shortcomings of fluid-level measurement methods currently being used, including limited applicability of any one fluid-level sensor design. Measurement acquisition shortcomings include the necessity for power to be supplied to each sensor and for the measurement to be extracted from each sensor via a physical connection to the sensor. Another shortcoming is existing measurement systems require that a data channel and signal conditioning electronics be dedicated to each sensor. Use of wires results in other shortcomings such as logistics needed to add or replace sensors, weight, potential for electrical arcing and wire degradations. The fluid level sensor design is a simple passive inductor-capacitor circuit that is not subject to mechanical failure that is possible when float and lever-arm systems are used. Methods are presented for using the sensor in caustic, acidic or cryogenic fluids. Oscillating magnetic fields are used to power the sensor. Once electrically excited, the sensor produces a magnetic field response. The response frequency corresponds to the amount to fluid within the capacitor s electric field. The sensor design can be modified for measuring the level of any fluid or fluent substance that can be stored in a non-conductive reservoir. The interrogation method for discerning changes in the sensor response frequency is also presented.
Author
Sensors; Level (Quantity); Cryogenic Fluids; Wireless Communication

20060022521 NASA Langley Research Center, Hampton, VA, USA
Experimental Investigation of a 2D Supercritical Circulation-Control Airfoil Using Particle Image Velocimetry
Jones, Gregory S.; Yao, Chung-Sheng; Allan, Brian G.; [2006]; 20 pp.; In English; 3rd AIAA Flow Control Conference, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations
Report No.(s): AIAA Paper 2006-3009; No Copyright; Avail.: CASI: A03, Hardcopy

Recent efforts in extreme short takeoff and landing aircraft configurations have renewed the interest in circulation control wing design and optimization. The key to accurately designing and optimizing these configurations rests in the modeling of the complex physics of these flows. This paper will highlight the physics of the stagnation and separation regions on two typical circulation control airfoil sections.
Author
Circulation Control Airfoils; Particle Image Velocimetry; Two Dimensional Flow; Supercritical Airfoils; Computational Fluid Dynamics

20060022543 NASA Langley Research Center, Hampton, VA, USA
Simulations of Bluff Body Flow Interaction for Noise Source Modeling
Khorrami, Medi R.; Lockard David P.; Choudhari, Meelan M.; Jenkins, Luther N.; Neuhart, Dan H.; McGinley, Catherine B.; [2006]; 30 pp.; In English; 36th AIAA Fluid Dynamics Conference and Exhibit, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.07
Report No.(s): AIAA Paper 2006-3203; No Copyright; Avail.: CASI: A03, Hardcopy

The current study is a continuation of our effort to characterize the details of flow interaction between two cylinders in a tandem configuration. This configuration is viewed to possess many of the pertinent flow features of the highly interactive unsteady flow field associated with the main landing gear of large civil transports. The present effort extends our previous two-dimensional, unsteady, Reynolds Averaged Navier-Stokes computations to three dimensions using a quasilaminar, zonal approach, in conjunction with a two-equation turbulence model. Two distinct separation length-to-diameter ratios of L/D = 3.7 and 1.435, representing intermediate and short separation distances between the two cylinders, are simulated. The Mach 0.166 simulations are performed at a Reynolds number of Re = 1.66 105 to match the companion experiments at NASA Langley Research Center. Extensive comparisons with the measured steady and unsteady surface pressure and off-surface particle image velocimetry data show encouraging agreement. Both prominent and some of the more subtle trends in the mean and fluctuating flow fields are correctly predicted. Both computations and the measured data reveal a more robust and energetic shedding process at L/D = 3.7 in comparison with the weaker shedding in the shorter separation case of L/D = 1.435. The vortex shedding frequency based on the computed surface pressure spectra is in reasonable agreement with the measured Strouhal frequency.
Author
Bluff Bodies; Flow Distribution; Simulation; Noise Measurement; Turbulence Models

20060022545 NASA Langley Research Center, Hampton, VA, USA
Development of a Boundary Layer Property Interpolation Tool in Support of Orbiter Return To Flight
Greene, Francis A.; Hamilton, H. Harris; [2006]; 17 pp.; In English; 9th AIAA/ASME Joint Thermophysics and Heat Transfer Conference, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 23-376-70-30-08
Report No.(s): AIAA Paper 2006-2920; Copyright; Avail.: CASI: A03, Hardcopy

A new tool was developed to predict the boundary layer quantities required by several physics-based predictive/analytic methods that assess damaged Orbiter tile. This new tool, the Boundary Layer Property Prediction (BLPROP) tool, supplies boundary layer values used in correlations that determine boundary layer transition onset and surface heating-rate augmentation/attenuation factors inside tile gouges (i.e. cavities). BLPROP interpolates through a database of computed solutions and provides boundary layer and wall data (delta, theta, Re(sub theta)/M(sub e), Re(sub theta)/M(sub e), Re(sub theta), P(sub w), and q(sub w)) based on user input surface location and free stream conditions. Surface locations are limited to the Orbiter s windward surface. Constructed using predictions from an inviscid w/boundary-layer method and benchmark viscous CFD, the computed database covers the hypersonic continuum flight regime based on two reference flight trajectories. First-order one-dimensional Lagrange interpolation accounts for Mach number and angle-of-attack variations, whereas non-dimensional normalization accounts for differences between the reference and input Reynolds number. Employing the same computational methods used to construct the database, solutions at other trajectory points taken from previous STS flights were computed: these results validate the BLPROP algorithm. Percentage differences between interpolated and computed values are presented and are used to establish the level of uncertainty of the new tool.
Author
Boundary Layer Transition; Interpolation; Space Shuttle Orbiters; Computational Fluid Dynamics; Algorithms

20060022546 NASA Langley Research Center, Hampton, VA, USA

Parallel, Gradient-Based Anisotropic Mesh Adaptation for Re-entry Vehicle Configurations

Bibb, Karen L.; Gnoffo, Peter A.; Park, Michael A.; Jones, William T.; [2006]; 21 pp.; In English; 9th AIAA/ASME Joint Thermophysics and Heat Transfer Conference, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations

Report No.(s): AIAA Paper 2006-3579; No Copyright; Avail.: CASI: A03, Hardcopy

Two gradient-based adaptation methodologies have been implemented into the Fun3d refine GridEx infrastructure. A spring-analogy adaptation which provides for nodal movement to cluster mesh nodes in the vicinity of strong shocks has been extended for general use within Fun3d, and is demonstrated for a 70 sphere cone at Mach 2. A more general feature-based adaptation metric has been developed for use with the adaptation mechanics available in Fun3d, and is applicable to any unstructured, tetrahedral, flow solver. The basic functionality of general adaptation is explored through a case of flow over the forebody of a 70 sphere cone at Mach 6. A practical application of Mach 10 flow over an Apollo capsule, computed with the Felisa flow solver, is given to compare the adaptive mesh refinement with uniform mesh refinement. The examples of the paper demonstrate that the gradient-based adaptation capability as implemented can give an improvement in solution quality.

Author

Anisotropy; Computational Grids; Reentry Vehicles; Spacecraft Configurations; Computational Fluid Dynamics; Parallel Processing (Computers)

35
INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation*; and *19 Spacecraft Instrumentation and Astrionics*.

20060021673 Arkansas Univ., Fayetteville, AR USA

Commercial Practices as Applied to Total Asset Visibility

Mason, Scott J; Chimka, Justin; Yeung, Thomas; Greiner, Michael; Dec 2003; 71 pp.; In English

Contract(s)/Grant(s): F33615-99-D-6001

Report No.(s): AD-A447723; ATA0201; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447723; Avail.: CASI: A04, Hardcopy

This document provides an overview of the military's objective for their Joint Total Asset Visibility (JTAV) 2020 program. In addition, this document reviews the current supply chain of the Air Force and attempts to identify areas of improvement and makes recommendations as to how specific areas of the supply chain might be enhanced through current commercial practices and technology regarding asset visibility. Extensive research has been reported in the fields of Automatic Identification (Auto-ID) and Radio Frequency Identification (RFID) along with other current commercial practices and technology involving asset visibility. RFID combined with an effective database system will give the Air Force complete visibility into its supply chain. The Air Force will have the ability to locate materiel anywhere in the world in real time. It is recommended that the Air Force adopt RFID tags and readers throughout the supply chain that interface with the database system described above.

DTIC

Logistics Management; Procedures; Visibility

20060021744 Cubic Applications, Inc., Alexandria, VA USA

Biological Defense: Evaluating Sensor Array Quantity and Quality versus Detection Capability

Webb, Brock; Sep 30, 2005; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447858; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447858; Avail.: CASI: A03, Hardcopy

RESULTS & CONCLUSIONS: (1) Total count of releases meeting detection criteria is a much better metric for evaluating the notional sensor array performance; (2) 0.5 kg scenarios were the main driver for reduced performance; (3) 1-ACPLA sensors outperform all other sensors and cost less for 100% detection when considering non-perfect sensors; (4)

Based on the results, reject the hypothesis that an increased quantity of cheaper sensors provides an equivalent or better detection capability for less cost.
DTIC
Biological Effects; Detection

20060021811 Defense Acquisition Univ., Fort Belvoir, VA USA
Intelligence, Surveillance, and Reconnaissance (ISR) Programs: Issues for Congress
Best, Jr , Richard A; Feb 22, 2005; 31 pp.; In English
Report No.(s): AD-A447906; CRS-RL32508; No Copyright; Avail.: CASI: A03, Hardcopy

Intelligence, surveillance, and reconnaissance (ISR) functions are principal elements of U.S. defense capabilities, and include a wide variety of systems for acquiring and processing information needed by national security decision makers and military commanders. ISR systems range in size from hand-held devices to orbiting satellites. Some collect basic information for a wide range of analytical products; others are designed to acquire data for specific weapons systems. Some are national systems intended primarily to collect information of interest to Washington-area agencies; others are tactical systems intended to support military commanders on the battlefield. Collectively, they account for a major portion of U.S. intelligence spending that, according to media estimates, amounts to some $40 billion annually.
DTIC
Intelligence; Reconnaissance; Surveillance

20060021985 NASA Glenn Research Center, Cleveland, OH, USA
Restricted Acoustic Modal Analysis Applied to Internal Combustor Spectra and Cross-Spectra Measurements
Miles, Jeffrey Hilton; May 2006; 34 pp.; In English; 12th Aeroacoustics Conference, 8-10 May 2006, Cambridge, MA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 581-02-08-03
Report No.(s): NASA/TM-2006-214351; E-15626; AIAA Paper 2006-2581; No Copyright; Avail.: CASI: A03, Hardcopy

A treatment of the modal decomposition of the pressure field in a combustor as determined by two Kulite pressure measurements is developed herein. It is applied to a Pratt & Whitney PW4098 engine combustor over a range of operating conditions. For modes other than the plane wave the new part of the treatment is the assumption that there are distinct frequency bands in which the individual modes, including the plane wave mode, overlap such that if circumferential mode m and circumferential mode m-1 are present than circumferential mode m 2 is not. Consequently, in the analysis used herein at frequencies above the first cut-off mode frequency, only pairs of circumferential modes are individually present at each frequency. Consequently, this is a restricted modal analysis. A new result is that the successful use of the same modal span frequencies over a range of operating conditions for this particular engine suggests that the temperature, T, and the velocity, v, of the flow at each operating condition are related by c(sup 2)-v(sup 2) = a constant where c is the speed of sound.
Author
Combustion Chambers; Acoustic Velocity; Acoustic Measurement; Pressure Measurement; Pressure Distribution; Plane Waves

20060022066 NASA Glenn Research Center, Cleveland, OH, USA
Procedure for Separating Noise Sources in Measurements of Turbofan Engine Core Noise
Miles, Jeffrey Hilton; May 2006; 25 pp.; In English; 12th Aeroacoustics Conference, 8-10 May 2006, Cambridge, MA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 581-02-08-03
Report No.(s): NASA/TM-2006-214352; AIAA Paper 2006-2580; E-15627; No Copyright; Avail.: CASI: A03, Hardcopy

The study of core noise from turbofan engines has become more important as noise from other sources like the fan and jet have been reduced. A multiple microphone and acoustic source modeling method to separate correlated and uncorrelated sources has been developed. The auto and cross spectrum in the frequency range below 1000 Hz is fitted with a noise propagation model based on a source couplet consisting of a single incoherent source with a single coherent source or a source triplet consisting of a single incoherent source with two coherent point sources. Examples are presented using data from a Pratt & Whitney PW4098 turbofan engine. The method works well.
Author
Engine Noise; Noise Measurement; Sound Generators; Turbofan Engines; Noise Propagation; Frequency Ranges

20060022149 NASA Langley Research Center, Hampton, VA, USA

Simultaneous CARS and Interferometric Rayleigh Scattering

Bivolaru, Daniel; Danehy, Paul M.; Grinstead, Keith D., Jr.; Tedder, Sarah; Cutler, Andrew D.; 2006; 8 pp.; In English; 25th AIAA Aerodynamic Measurement Technology and Ground Testing Conference, 5-8 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): 489-02-07-07

Report No.(s): AIAA Paper 2006-2968; Copyright; Avail.: CASI: A02, Hardcopy

This paper reports for the first time the combination of a dual-pump coherent anti-Stokes Raman scattering system with an interferometric Rayleigh scattering system (CARS - IRS) to provide time-resolved simultaneous measurement of multiple properties in combustion flows. The system uses spectrally narrow green (seeded Nd:YAG at 532 nm) and yellow (552.9 nm) pump beams and a spectrally-broad red (607 nm) beam as the Stokes beam. A spectrometer and a planar Fabry-Perot interferometer used in the imaging mode are used to record the spectrally broad CARS spectra and the spontaneous Rayleigh scattering spectra, respectively. Time-resolved simultaneous measurement of temperature, absolute mole fractions of N2, O2, and H2, and two components of velocity in a Hencken burner flame were performed to demonstrate the technique.

Author

Imaging Techniques; Interferometry; Raman Spectra; Rayleigh Scattering

20060022232 Johns Hopkins Univ., Laurel, MD USA

System of Systems Operational Analysis Within a Common Operational Context

Flanigan, David A; Jun 22, 2005; 33 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447947; No Copyright; Avail.: CASI: A03, Hardcopy

Presentation of System of Systems operational analysis within a common operational context. The objective is: to develop a process to analyze the value of a system of systems (SoS) effort towards mission accomplishment. This example will focus on a surface warfare (SUW) scenario in the littorals for describing the process and example analysis. Also, to provide a methodology to utilize multiple tools towards generating a solution to the given problem set. The agenda consists of: problem space; SoS analysis process: scenario setup, tie-in with other tools, execution and analysis; SUW example; Conclusion.

DTIC

Systems Analysis; Complex Systems

20060022241 Maryland Univ., College Park, MD USA

Handwriting Identification, Matching, and Indexing in Noisy Document Images

Zheng, Yefeng; Jan 2006; 118 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): MDA-9040-2C-0406

Report No.(s): AD-A447910; LAMP-TR-129; CS-TR-4781; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Throughout history, handwriting has been the primary means of recording information that is preserved across both time and space. With the coming of the electronic document era, we are challenged with making an enormous amount of handwritten documents available for electronic access. Though many handwritten documents contain only hand-writing, now, more are mixed with printed text, noise, and background patterns. The mixture of handwriting with other components presents a great challenge for making an original document electronically accessible. Many handwritten documents come together with a special background pattern, rule lines, which are printed on the paper to guide writing. After digitization, rule lines will touch text and cause problems for further document image analysis if they are not detected and removed. In this dissertation, we present a rule line detection algorithm based on hidden Markov model (HMM) decoding, achieving both high detection accuracy and a low false alarm rate. After detection, line removal is performed by line width thresholding.

DTIC

Handwriting; Markov Processes

20060022531 University of Southern California, Los Angeles, CA USA

Complex Spatial/Temporal CFAR

Ebrahimian, Z; Jan 2005; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447389; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447389; Avail.: Defense Technical Information Center (DTIC)

The conventional cell averaging Constant False Alarm Rate (CFAR) criterion and its variations work well only in strictly

spatially stationary environments. In non-homogeneous environments, clutter map (scan-by-scan) processing is deployed. The performance of this method degrades in the presence of slow targets. In this paper, a hybrid procedure for CFAR is proposed, which combines the advantages of both spatial and time averaging. The detection probability is derived and the related plots are given for different values of L, the number of persistence scans. A method is presented to choose the parameter of the hybrid CFAR to have the lowest self-masking effect.
DTIC
False Alarms; Probability Theory; Deployment; Radar Signatures

37
MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

20060021659 American Bureau of Shipping, NY USA
The National Shipbuilding Research Program. Proceedings of the IREAPS Technical Symposium. Paper No. 26: Weld Acceptance Standards. Volume 1
Stern, Irving L; Sep 1982; 24 pp.; In English
Report No.(s): AD-A447698; NSRP-0009; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447698; Avail.: CASI: A03, Hardcopy

The presentation will cover the objectives and summarize the progress of MARAD SP-7 Panel programs on (a) development of reference standards for visual inspection welds, and (b) evaluation of the quality of existing ship welds by ultrasonics. The relationship of the visual acceptance standards; quality control procedures, quality of production welds and the significance of representing acceptance standards with model reference standards will be discussed. Ultrasonic evaluation of the quality of existing ship welds will be related to the existing radiographic and ultrasonic examination' conducted outside areas required by the governing code or rules. This may occur in new construction or after various periods of service. Unnecessary repairs can be costly and at times can degrade rather than improve structural reliability; on the other hand, internal discontinuities that represent a significant degradation of structure should be repaired. The ultrasonic evaluation program will be related to the above as well as to the ABS guidelines to cover analogous cases.
DTIC
Conferences; Inspection; Marine Technology; Radiography; Ships; Ultrasonics; Visual Observation; Welded Joints

20060021705 Bath Iron Works Corp., ME USA
The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 2: N/C Justification in the Shipyard
French, Charles M; Jun 1977; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447771; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447771; Avail.: CASI: A03, Hardcopy

The paper discussed the questions raised and the justification raised for a large capital expenditure to convert to computer aided lofting and Numerical Control (N/C) burning.
DTIC
Computer Aided Manufacturing; Conferences; Marine Technology; Ships; Shipyards

38
QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, quality control, inspection, maintainability, and standardization.

20060022138 NASA Johnson Space Center, Houston, TX, USA
NASA Taxonomies for Searching Problem Reports and FMEAs
Malin, Jane T.; Throop, David R.; [2006]; 1 pp.; In English; Ultra Reliability 2006 Workshop, 20-21 Jun. 2006, Huntsville, AL, USA
Contract(s)/Grant(s): ITA-5600; No Copyright; Avail.: Other Sources; Abstract Only

Many types of hazard and risk analyses are used during the life cycle of complex systems, including Failure Modes and Effects Analysis (FMEA), Hazard Analysis, Fault Tree and Event Tree Analysis, Probabilistic Risk Assessment, Reliability Analysis and analysis of Problem Reporting and Corrective Action (PRACA) databases. The success of these methods depends on the availability of input data and the analysts knowledge. Standard nomenclature can increase the reusability of hazard, risk and problem data. When nomenclature in the source texts is not standard, taxonomies with mapping words (sets of rough synonyms) can be combined with semantic search to identify items and tag them with metadata based on a rich standard nomenclature. Semantic search uses word meanings in the context of parsed phrases to find matches. The NASA taxonomies provide the word meanings. Spacecraft taxonomies and ontologies (generalization hierarchies with attributes and relationships, based on terms meanings) are being developed for types of subsystems, functions, entities, hazards and failures. The ontologies are broad and general, covering hardware, software and human systems. Semantic search of Space Station texts was used to validate and extend the taxonomies. The taxonomies have also been used to extract system connectivity (interaction) models and functions from requirements text. Now the Reconciler semantic search tool and the taxonomies are being applied to improve search in the Space Shuttle PRACA database, to discover recurring patterns of failure. Usual methods of string search and keyword search fall short because the entries are terse and have numerous shortcuts (irregular abbreviations, nonstandard acronyms, cryptic codes) and modifier words cannot be used in sentence context to refine the search. The limited and fixed FMEA categories associated with the entries do not make the fine distinctions needed in the search. The approach assigns PRACA report titles to problem classes in the taxonomy. Each ontology class includes mapping words - near-synonyms naming different manifestations of that problem class. The mapping words for Problems, Entities and Functions are converted to a canonical form plus any of a small set of modifier words (e.g. non-uniformity NOT + UNIFORM.) The report titles are parsed as sentences if possible, or treated as a flat sequence of word tokens if parsing fails. When canonical forms in the title match mapping words, the PRACA entry is associated with the corresponding Problem, Entity or Function in the ontology. The user can search for types of failures associated with types of equipment, clustering by type of problem (e.g., all bearings found with problems of being uneven: rough, irregular, gritty). The results could also be used for tagging PRACA report entries with rich metadata. This approach could also be applied to searching and tagging failure modes, failure effects and mitigations in FMEAs. In the pilot work, parsing 52K+ truncated titles (the test cases that were available), has resulted in identification of both a type of equipment and type of problem in about 75% of the cases. The results are displayed in a manner analogous to Google search results. The effort has also led to the enrichment of the taxonomy, adding some new categories and many new mapping words. Further work would make enhancements that have been identified for improving the clustering and further reducing the false alarm rate. (In searching for recurring problems, good clustering is more important than reducing false alarms). Searching complete PRACA reports should lead to immediate improvement. Author

Failure Analysis; Failure Modes; Taxonomy; NASA Programs; Complex Systems

39
STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structures. For applications see *05 Aircraft Design, Testing and Performance*; and *18 Spacecraft Design, Testing and Performance*.

20060021602 General Electric Aircraft Engines, Lynn, MA, USA

Large Engine Technology (LET) Short Haul Civil Tiltrotor Contingency Power Materials Knowledge and Lifing Methodologies

Spring, Samuel D.; May 2006; 67 pp.; In English; AST036; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAS3-26617; WBS 22-714-85-01

Report No.(s): NASA/CR-2006-213378; E-14886; No Copyright; Avail.: CASI: A04, Hardcopy

This report documents the results of an experimental program conducted on two advanced metallic alloy systems (Rene' 142 directionally solidified alloy (DS) and Rene' N6 single crystal alloy) and the characterization of two distinct internal state variable inelastic constitutive models. The long term objective of the study was to develop a computational life prediction methodology that can integrate the obtained material data. A specialized test matrix for characterizing advanced unified viscoplastic models was specified and conducted. This matrix included strain controlled tensile tests with intermittent relaxtion test with 2 hr hold times, constant stress creep tests, stepped creep tests, mixed creep and plasticity tests, cyclic temperature creep tests and tests in which temperature overloads were present to simulate actual operation conditions for validation of the models. The selected internal state variable models where shown to be capable of representing the material behavior exhibited

by the experimental results; however the program ended prior to final validation of the models.
Author
Engine Design; Tilt Rotor Aircraft; Life (Durability); Stress Measurement; Tensile Tests; Creep Tests

20060021971 Akron Univ., Akron, OH, USA
Enhancement of the Feature Extraction Capability in Global Damage Detection Using Wavelet Theory
Saleeb, Atef F.; Ponnaluru, Gopi Krishna; May 2006; 153 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NCC3-808; WBS 846-02-07-03
Report No.(s): NASA/CR-2006-214225; E-15040; No Copyright; Avail.: CASI: A08, Hardcopy

The main objective of this study is to assess the specific capabilities of the defect energy parameter technique for global damage detection developed by Saleeb and coworkers. The feature extraction is the most important capability in any damage-detection technique. Features are any parameters extracted from the processed measurement data in order to enhance damage detection. The damage feature extraction capability was studied extensively by analyzing various simulation results. The practical significance in structural health monitoring is that the detection at early stages of small-size defects is always desirable. The amount of changes in the structure's response due to these small defects was determined to show the needed level of accuracy in the experimental methods. The arrangement of fine/extensive sensor network to measure required data for the detection is an 'unlimited' ability, but there is a difficulty to place extensive number of sensors on a structure. Therefore, an investigation was conducted using the measurements of coarse sensor network. The white and the pink noises, which cover most of the frequency ranges that are typically encountered in the many measuring devices used (e.g., accelerometers, strain gauges, etc.) are added to the displacements to investigate the effect of noisy measurements in the detection technique. The noisy displacements and the noisy damage parameter values are used to study the signal feature reconstruction using wavelets. The enhancement of the feature extraction capability was successfully achieved by the wavelet theory.
Author
Wavelet Analysis; Damage; Detection; Pattern Recognition; Signal Processing; Accelerometers; Frequency Ranges

42
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

20060022065 NASA Johnson Space Center, Houston, TX, USA
Persnickety editor, Founding Father, Mentor and Friend: The Legacy of Fred Mumpton
Ming, Douglas W.; [2006]; 3 pp.; In English; 7th International Conference on Occurrence, Prop and Util of Zeolites, 17-21 Jul. 2006, Socorro, NM, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

This paper is a tribute to Dr Fred Munpton, the founder of the International Committee on Natural Zeolites (ICNZ), by one of his students, who later succeed him as president of the ICNZ. The tribute reflects on Dr. Mumpton's skills as an editor and his zeal for the study of natural zeolites.
CASI
Zeolites; Technical Writing

43
EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photography. For related instrumentation see *35 Instrumentation and Photography*.

20060021738 Army Engineer Research and Development Center, Vicksburg, MS USA
A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Depression Wetlands in the Upper Des Plaines River Basin
Lin, Jeff P; May 2006; 111 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447845; ERDC/EL-TR-06-4; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447845; Avail.: CASI: A06, Hardcopy

This Regional Guidebook characterizes the wetlands in the Upper Des Plaines River Basin using the hydrogeomorphic (HGM) approach. The HGM approach is a collection of concepts and methods used to develop functional indices to assess the capacity of a particular wetland to perform functions relative to similar wetlands in a region. Specifically, this report describes the rationale that was used to select functions for two subclasses of herbaceous freshwater depressions, the Isolated Depression subclass and the Floodplain Depression subclass. The report also describes the process used to select model variables and metrics and to develop assessment models. Data from reference wetlands are provided and used to calibrate model variables and assessment models. Protocols for applying functional indices to the assessment of wetland functions are provided.

DTIC

Handbooks; River Basins; Rivers; Watersheds; Wetlands

20060021844 Naval Postgraduate School, Monterey, CA USA

Generating Enhanced Natural Environments and Terrain for Interactive Combat Simulations (GENETICS)

Wells, William D; Jun 23, 2005; 84 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447956; No Copyright; Avail.: CASI: A05, Hardcopy

GENETICS Project Overview: (1) Automatically construct realistic, vegetation-laden terrain using a minimum amount of readily-available source data, adding plausible details as needed. (2) This procedurally-created terrain must be replicable across a wide variety of simulation platforms, creating a consistent virtual world without any terrain databases being shared.

DTIC

Combat; Distributed Interactive Simulation; Genetics; Simulation; Terrain

20060021871 California Univ., Santa Barbara, CA USA

Effects of Surface Slope on Erosion Rates of Quartz Particles

Lodge, Phillip; Mar 2006; 51 pp.; In English

Report No.(s): AD-A448005; No Copyright; Avail.: CASI: A04, Hardcopy

Modeling sediment erosion is important in a wide range of environmental problems. The effects of various environmental factors on erosion rates have been studied, but the effects of surface slope on erosion rates of a wide range of sediments have not been quantified. The effects of surface slope, both in the direction of flow (pitch) and perpendicular to the flow (roll), on erosion rates of quartz particles were investigated using the Sediment Erosion at Depth Flume (Sedflume).

DTIC

Erosion; Quartz; Slopes; Water Erosion

20060022064 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Accuracy of Geophysical Parameters Derived from AIRS/AMSU as a Function of Fractional Cloud Cover

Susskind, Joel; Barnet, Chris; Blaisdell, John; Iredell, Lena; Keita, Fricky; Kouvaris, Lou; Molnar, Gyula; Chahine, Moustafa; January 2006; 48 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

AIRS was launched on EOS Aqua on May 4,2002, together with AMSU A and HSB, to form a next generation polar orbiting infrared and microwave atmospheric sounding system. The primary products of AIRS/AMSU are twice daily global fields of atmospheric temperature-humidity profiles, ozone profiles, sea/land surface skin temperature, and cloud related parameters including OLR. The sounding goals of AIRS are to produce 1 km tropospheric layer mean temperatures with an rms error of lK, and layer precipitable water with an rms error of 20 percent, in cases with up to 80 percent effective cloud cover. The basic theory used to analyze Atmospheric InfraRed Sounder/Advanced Microwave Sounding Unit/Humidity Sounder Brazil (AIRS/AMSU/HSB) data in the presence of clouds, called the at-launch algorithm, was described previously. Pre-launch simulation studies using this algorithm indicated that these results should be achievable. Some modifications have been made to the at-launch retrieval algorithm as described in this paper. Sample fields of parameters retrieved from AIRS/AMSU/HSB data are presented and validated as a function of retrieved fractional cloud cover. As in simulation, the degradation of retrieval accuracy with increasing cloud cover is small and the RMS accuracy of lower tropospheric temperature retrieved with 80 percent cloud cover is about 0.5 K poorer than for clear cases. HSB failed in February 2003, and consequently HSB channel radiances are not used in the results shown in this paper. The AIRS/AMSU retrieval algorithm described in this paper, called Version 4, become operational at the Goddard DAAC (Distributed Active Archive Center) in April 2003 and is being used to analyze near-real time AIRS/AMSU data. Historical AIRS/AMSU data, going backwards from

March 2005 through September 2002, is also being analyzed by the DAAC using the Version 4 algorithm.
Author
Algorithms; Atmospheric Sounding; Atmospheric Temperature; Geophysics; Data Acquisition; Earth Observations (From Space)

44
ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*; and *28 Propellants and Fuels*.

20060021631 National Renewable Energy Lab., Golden, CO USA, Toledo Univ., OH, USA
High Efficiency and High Rate Deposited Amorphous Silicon-Based Solar Cells. Final Report, September 1, 2001-March 6, 2005
Deng, X.; Jan. 2006; 106 pp.; In English
Report No.(s): DE2006-875762; NREL/SR-520-39091; No Copyright; Avail.: National Technical Information Service (NTIS)

This final technical report covers the highlights of the research activities and results on the project of 'High Efficiency and High-Rate Deposited Amorphous Silicon-Based Solar Cells' at the University of Toledo for the Period of September 1, 2001 to March 6, 2005, under NREL Subcontract No. NDJ-2- 30630-08. The objectives of this project are: (1) to establish a transferable knowledge and technology base for the fabrication of high-efficiency triple-junction a-Si-based solar cells, and (2) to develop high-rate deposition techniques for the growth of a-Si-based and related alloys.
NTIS
Amorphous Materials; Silicon; Solar Cells

20060021826 Massachusetts Inst. of Tech., Cambridge, MA USA
Fabrication and Characterization of a Micro Turbine/Bearing Rig
Lin, Chuang-Chia; Ghodssi, Reza; Ayon, Arturo A; Chen, Dye-Zone; Jacobson, Stuart; Breuer, Kenneth; Epstein, Alan H; Schmidt, Martin A; Jan 2006; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447928; No Copyright; Avail.: CASI: A02, Hardcopy

This paper reports on a process to build, package, and instrument a 5-level wafer-bonded micro-machined turbine/bearing rig. The process flow involves the use of 5 wafers, 16 masks, and 9 deep silicon etching steps. It also utilizes aligned wafer bonding, double-sided deep reactive ion etching (DRIE), and Laser-Assisted-Etching (LAE). The paper also presents experimental results on flow characteristics of the hydrostatic thrust bearings and the preliminary rotational performance of the device.
DTIC
Fabrication; Gas Turbines; Microminiaturization; Turbines

20060021947 NASA Glenn Research Center, Cleveland, OH, USA
Bench-Scale Monolith Autothermal Reformer Catalyst Screening Evaluations in a Micro-Reactor With Jet-A Fuel
Tomsik, Thomas M.; Yen, Judy C.H.; Budge, John R.; May 2006; 32 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 22-708-02-07
Report No.(s): NASA/TM-2006-214254; E-15536; Copyright; Avail.: CASI: A03, Hardcopy

Solid oxide fuel cell systems used in the aerospace or commercial aviation environment require a compact, light-weight and highly durable catalytic fuel processor. The fuel processing method considered here is an autothermal reforming (ATR) step. The ATR converts Jet-A fuel by a reaction with steam and air forming hydrogen (H2) and carbon monoxide (CO) to be used for production of electrical power in the fuel cell. This paper addresses the first phase of an experimental catalyst screening study, looking at the relative effectiveness of several monolith catalyst types when operating with untreated Jet-A fuel. Six monolith catalyst materials were selected for preliminary evaluation and experimental bench-scale screening in a small 0.05 kWe micro-reactor test apparatus. These tests were conducted to assess relative catalyst performance under atmospheric pressure ATR conditions and processing Jet-A fuel at a steam-to-carbon ratio of 3.5, a value higher than anticipated to be run in an optimized system. The average reformer efficiencies for the six catalysts tested ranged from 75 to 83 percent at a constant gas-hourly space velocity of 12,000 hr 1. The corresponding hydrocarbon conversion efficiency varied

from 86 to 95 percent during experiments run at reaction temperatures between 750 to 830 C. Based on the results of the short-duration 100 hr tests reported herein, two of the highest performing catalysts were selected for further evaluation in a follow-on 1000 hr life durability study in Phase II.
Author
Catalysts; Jet Engine Fuels; Solid Oxide Fuel Cells; Energy Conversion; Fuel Cell Power Plants

20060021994 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Integrated Modeling of Building Energy Requirements Incorporating Solar Assisted Cooling
Firestone, R.; Marnay, C.; Wang, J.; January 2005; 10 pp.; In English
Report No.(s): DE2006-875752; No Copyright; Avail.: National Technical Information Service (NTIS)
This paper expands on prior Berkeley Lab work on integrated simulation of building energy systems by the addition of active solar thermal collecting devices, technology options not previously considered (Siddiqui et al 2005). Collectors can be used as an alternative or additional source of hot water to heat recovery from reciprocating engines or microturbines. An example study is presented that evaluates the operation of solar assisted cooling at a large mail sorting facility in southern California with negligible heat loads and year-round cooling loads. Under current conditions solar thermal energy collection proves an unattractive option, but is a viable carbon emission control strategy.
NTIS
Energy Requirements; Models; Solar Cooling

45
ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20060021581 Institute of Paper Science and Technology, Atlanta, GA, USA
Improving Dryer and Press Efficiencies Through Combustion of Hydrocarbon Emissions
Banerjee, S.; Oct. 2005; 66 pp.; In English
Report No.(s): DE2006-875906; No Copyright; Avail.: Department of Energy Information Bridge
Emission control devices on dryers and presses have been legislated into the industry, and are now an integral part of the drying system. These devices consume large quantities of natural gas and electricity and down-sizing or eliminating them will provide major energy savings. The principal strategy taken here focuses on developing process changes that should minimize (and in some cases eliminate) the need for controls. A second approach is to develop lower-cost control options. It has been shown in laboratory and full-scale work that Hazardous Air Pollutants (HAPs) emerge mainly at the end of the press cycle for particleboard, and, by extension, to other products. Hence, only the air associated with this point of the cycle need be captured and treated. A model for estimating terpene emissions to be concentrated in some zones and minimized in others, so that some of the air could be directly released without controls. Low-cost catalysts have been developed for controlling HAPs from dryers and presses. Catalysts conventionally used for regenerative catalytic oxidizers can be used at much lower temperatures for treating press emissions. Fluidized wood was is an especially inexpensive material for efficiently reducing formaldehyde in dryer emissions. A heat transfer model for estimating pinene emissions from hot-pressing strand for the manufacture for flakeboard has been constructed from first principles and validated.
NTIS
Air Pollution; Combustion; Drying Apparatus; Efficiency; Hydrocarbons; Pollution Control; Presses; Wood

20060021613 California Univ., Riverside, CA USA
Post Regulatory Evaluation of the Cost and Economic Estimates of Air Pollution Control Regulations
Lents, J.; Schwabe, K.; Apr. 2006; 150 pp.; In English
Report No.(s): PB2006-110494; CARB-01-335; No Copyright; Avail.: CASI: A07, Hardcopy
An ex ante and ex post cost analysis was conducted on selected rules in California to compare the accuracy of both the industry's and regulator's estimated cost impacts with the actual cost of the rule after implementation. Ten candidate rules were identified from public hearing records at the California Air Resources Board (CARB) and the South Coast Air Quality Management District (SCAQMD). More in-depth research of these public records yielded ex ante cost information for eight of the ten rules. Three different efforts to contact stakeholders yielded ex post cost information, of varying degrees, for six of the eight rules. A comparison was made between the ex ante costs developed by the regulatory agency as well as the stakeholders to the ex post costs for the six rules. The regulatory agencies estimated capital cost impacts similar to actual

impacts on five of the six rules fully analyzed. For cost per ton reduced, the agencies estimated very similar costs to the actual in two cases, overestimated somewhat for three cases, and underestimated in one of these cases. In the remaining case, the ex post cost information obtained was anecdotal and not sufficient to allow conclusion. In each case, the projection of the economic impact of the rule made by the stakeholders is significantly higher than the projection made by the agency. The capital costs comparison is considered more robust and accurate than analyses considering emissions data due to the difficulty in obtaining actual emissions reduction from stakeholders. A complete analysis of each rule along with recommendations for improving the process and availability of ex post information is discussed.
NTIS
Air Pollution; Air Quality; Cost Estimates; Economics; Pollution Control; Regulations

20060021615 California Univ., Los Angeles, CA, USA
Development and Application of Ambient Aerosol Concentrators to Conduct Health Effects Studies in the Los Angeles Basin
Froines, J. R.; May 2006; 104 pp.; In English
Report No.(s): PB2006-110495; ARB-R-98-316; No Copyright; Avail.: CASI: A06, Hardcopy

A transportable inhalation exposure facility that provides concentrated coarse, fine and ultrafine ambient particulate matter for studies in experimental animal models has been developed, constructed, and validated during the course of this five year research program. The facility can be configured to collect large quantities of size-selected particulate matter for compositional analysis of particles and for in vitro toxicology experiments. A similar concentrator system suitable for human exposure to coarse, fine and ultrafine ambient particles was also developed and validated. The concentrator systems were applied to investigations of hypotheses concerning the public health impacts of exposure to particulate matter, including field studies of mice and rats exposed to size selected particulate matter in locations around the Los Angeles Basin, such as near-source sites at freeways. A series of clinical studies on human volunteers has been initiated using the transportable concentrator systems, and extensive characterization studies of the chemical, physical and toxicological properties of ambient particulate matter were carried out on samples of particles that were collected for in vitro studies.
NTIS
Aerosols; Air Pollution; Concentrators; Health; Pollution Monitoring; Samplers

20060021624 National Inst. for Occupational Safety and Health, Washington, DC, USA
NIOSH Health Hazard Evaluation Report: HETA No. 2005-0126 and No. 2005-0138-3004, International Marine Terminal, Scotia Prince Cruises and Department of Homeland Security, U.S. Customs and Border Protection, Portland, Maine, May 2006
May 2006; 36 pp.; In English
Report No.(s): PB2006-112237; HETA-2005-0126; HETA-2005-0138-3004; No Copyright; Avail.: CASI: A03, Hardcopy

The National Institute for Occupational Safety and Health (NIOSH) received management requests for health hazard evaluations (HHEs) at Scotia Prince Cruises (SPC) and the USA Customs and Border Patrol (CBP) offices at the International Marine Terminal (IMT) in Portland, Maine. This request concerned possible health problems related to exposure to mold in the IMT offices, which were leased from the city of Portland. The IMT was undergoing mold abatement during the investigations in March 2005.
NTIS
Hazards; Health; Protection; Safety; Security

20060021625 Rochester Univ., NY, USA, National Inst. of Child Health and Human Development, Bethesda, MD, USA
Effects of Exposure to Ultrafine Carbon Particles in Healthy Subjects and Subjects with Asthma
Frampton, M. W.; Utell, M. J.; Zareba, W.; Oberdoerster, G.; Cox, C.; Dec. 2004; 80 pp.; In English
Report No.(s): PB2006-112283; No Copyright; Avail.: CASI: A05, Hardcopy

We developed and validated a system for exposing people via a mouthpiece to carbon ultrafine particles (UFP) and assessed the deposition of UFP in the airways. We hypothesized that exposure to UFP causes airway inflammation, with activation of circulating leukocytes and vascular endothelium, a systemic acute phase response, and transient hypercoagulability. We further hypothesized that in people with asthma, exposure to UFP would increase airway inflammation. We conducted three substudies: UPREST-healthy individuals breathing filtered air and UFP at rest; UPDOSE - healthy

subjects breathing air and UFP with intermittent exercise; and UPASTHMA - people with mild asthma breathing air and UFP with intermittent exercise. All exposures were for 2 hours.
NTIS
Asthma; Carbon; Exposure

20060021626 Arizona Univ., Tucson, AZ, USA, Wisconsin Univ., Madison, WI, USA
Neurogenic Responses in Rat Lungs After Nose-Only Exposure to Diesel Exhaust
Witten, M. L.; Wong, S. S.; Sun, N. N.; Keith, I.; Kweon, C. B.; Jan. 2005; 64 pp.; In English
Report No.(s): PB2006-112284; No Copyright; Avail.: CASI: A04, Hardcopy

The data suggest that neurokininergic mechanisms may have been involved in DE-induced inflammatory conditions in rat lung but that C fibers did not appear to be involved under these exposure conditions. We believe that time-course or protein knockdown/knockout animal studies are required to characterize further the role of neurokininergic mechanisms in DE-induced lung injury.
NTIS
Air Pollution; Combustion Products; Diesel Engines; Exhaust Emission; Exhaust Gases; Exposure; Lungs

20060021627 Lovelace Respiratory Research Inst., Albuquerque, NM, USA, Universidad Nacional Autonoma de Mexico, Mexico City, Mexico
Particle Size and Composition Related to Adverse Health Effects in Aged, Sensitive Rats
Hahn, F. F.; Barr, E. B.; Menache, M. G.; Seagrave, J. C.; Sep. 2005; 90 pp.; In English
Report No.(s): PB2006-112285; No Copyright; Avail.: CASI: A05, Hardcopy

Small increases in ambient particulate matter concentration have been linked to adverse health effects, especially in older people and people with preexisting respiratory disease. This study was designed to determine: (1) the relation between respirable particle size and particle toxicity and the health effects of short-term increases (spikes) in particle concentration; (2) the effect of spikes in concentration of fine and ultrafine particles of disparate composition: vanadium pentoxide (V2O5) and carbon black, as determined in aged rats with mild pulmonary inflammation induced by instilled endotoxin; (3) the influence of age on particle-induced toxicity.
NTIS
Air Pollution; Air Quality; Contaminants; Health; Rats; Sensitivity

20060021629 Environmental Protection Agency, Research Triangle Park, NC USA
Control of Mercury Emissions from Coal-Fired Electric Utility Boilers
January 2006; 20 pp.; In English
Report No.(s): PB2006-113230; No Copyright; Avail.: National Technical Information Service (NTIS)

During combustion, the mercury (Hg) in coal is volatilized and converted to elemental mercury (Hg0) vapor in the high temperature regions of coal-fired boilers. As the flue gas is cooled, a series of complex reactions begin to convert Hg0 to ionic mercury (Hg2+) compounds and/or Hg compounds (Hgp) that are in a solid-phase at flue gas cleaning temperatures or Hg that is adsorbed onto the surface of other particles. The presence of chlorine gas-phase equilibrium favors the formation of mercuric chloride (HgCl2) at flue gas cleaning temperatures. However, Hg0 oxidation reactions are kinetically limited and, as a result, Hg enters the flue gas cleaning device(s) as a mixture of Hg0, Hg 2+, and Hgp. This partitioning of Hg into Hg0, Hg 2+, and Hgp is known as mercury speciation, which can have considerable influence on selection of mercury control approaches. In general, the majority of gaseous mercury in bituminous coal-fired boilers is Hg2+. On the other hand, the majority of gaseous mercury in subbituminous- and lignite-fired boilers is Hg0. Control of mercury emissions from coal-fired boilers is currently achieved via existing controls used to remove particulate matter (PM), sulfur dioxide (SO2), and nitrogen oxides (NOx). This includes capture of Hgp in PM control equipment and soluble Hg 2+ compounds in wet flue gas desulfurization (FGD) systems. Available data also reflect that use of selective catalytic reduction (SCR) NOx control enhances oxidation of Hg0 in flue gas and results in increased mercury removal in wet FGD.
NTIS
Air Pollution; Boilers; Coal; Combustion; Mercury (Metal); Pollution Control

20060022729 Lawrence Livermore National Lab., Livermore, CA USA
LLNL NESHAPs 2004 Annual Report
January 2006; 56 pp.; In English
Report No.(s): DE2006-877888; UCRL-TR-113867-05; No Copyright; Avail.: National Technical Information Service (NTIS)

NESHAPs limits the emission of radionuclides to the ambient air from DOE facilities to levels resulting in an annual effective dose equivalent (EDE) of 10 mrem (100 mSv) to any member of the public. The EDEs for the Lawrence Livermore National Laboratory (LLNL) site-wide maximally exposed members of the public from operations in 2004 are summarized here. Livermore site: 0.0079 mrem (0.079 mSv) (27% from point-source emissions, 73% from diffuse-source emissions). The point-source emissions include gaseous tritium modeled as tritiated water vapor as directed by EPA Region IX; the resulting dose is used for compliance purposes. Site 300: 0.026 mrem (0.26 mSv) (97% from point-source emissions, 3% from diffuse-source emissions). The EDEs were calculated using the EPA-approved CAP88-PC air dispersion/doseassessment model, except for doses for two diffuse sources that were estimated using measured radionuclide concentrations and dose coefficients. Specific inputs to CAP88-PC for the modeled sources included site-specific meteorological data and source emissions data, the latter variously based on continuous stack effluent monitoring data, stack flow or other release-rate information, radionuclide usage inventories, ambient air monitoring data, and facility knowledge.
NTIS
Air Pollution; Exhaust Emission; Exhaust Gases; Pollution Control; Pollution Monitoring; Standards

46
GEOPHYSICS

Includes Earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology*; and *93 Space Radiation*.

20060021703 Spectral Sciences, Inc., Burlington, MA USA
Status of Atmospheric Correction using a MODTRAN4-Based Algorithm
Matthew, Michael W; Adler-Golden, Steven M; Berk, Alexander; Richtsmeier, Steven C; Levine, Robert Y; Bernstein, Lawrence S; Acharya, Prabhat K; Anderson, Gail P; Felde, Gerry W; Hoke, Michael P; Apr 2000; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-98-C-0050; NAS13-99014
Report No.(s): AD-A447767; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447767; Avail.: CASI: A03, Hard-copy

This paper presents an overview of the latest version of a MODTRAN4-based atmospheric correction (or 'compensation') algorithm developed by Spectral Sciences, Inc. and the Air Force Research Laboratory for spectral imaging sensors. New upgrades to the algorithm include automated aerosol retrieval, cloud masking, and speed improvements. In addition, MODTRAN4 has been updated to correct recently discovered errors in the HITRAN-96 water line parameters. Reflectance spectra retrieved from AVIRIS data are compared with 'ground truth' measurements, and good agreement is found.
DTIC
Algorithms; Atmospheric Correction; Atmospheric Physics

20060021829 Oregon State Univ., Corvallis, OR USA
Breaking and Non-Breaking Solitary Wave Impact Pressures on a Cylinder Over a 3-D Bathymetry
Bisgard, Charlie; Jan 2005; 96 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447936; No Copyright; Avail.: CASI: A05, Hardcopy

A tsunami is a wave or a series of waves principally generated by undersea earthquakes of magnitude greater than 6.5 on the Richter scale. These long period waves can also be created by other natural disturbances such as landslides, volcanic eruptions, and explosions near the sea surface. The word tsunami is used in place of tidal wave to remove any confusion with the astronomical tides. The word tsunami comes from the Japanese words tsu (harbor) and nami (wave) and is used to describe the large waves that are seismically produced. Tsunamis in general are the product of earthquakes that extend at least partially under the sea. These earthquakes or other undersea disruptions cause sudden vertical changes in the seafloor, which in turn cause a large volume of water to be displaced from its equilibrium position to a new position of rise or depression. This change in equilibrium then moves outwards from the source of origin in the form of a tsunami. Due to the way that tsunamis are generated, the energy of the tsunami waves are evenly distributed throughout the entire water column. This differentiates tsunamis from the common wind generated waves, in that wind waves in deepwater have most of their energy held in the region of the water column near to the surface. Tsunamis are extremely long waves with long periods that can range from five minutes to several hours. Due to their very long wavelengths, tsunamis travel at the shallow water wave celerity which is equal to the square root of the gravitational acceleration times the water depth. The speed of a tsunami in the open ocean can reach in excess of 500 miles per hour. Tsunamis are also characterized by low wave height when moving through oceanic depths

and are often hard to recognize when seen out in the deep ocean. As tsunamis approach the coastal region, they are affected by the rapid decrease in water depth.
DTIC
Bathymeters; Earthquakes; Impact Loads; Tsunami Waves

20060021892 Texas Univ., Austin, TX USA
Incorporating Digisonde Traces into the Ionospheric Data Assimilation Three Dimensional (IDA3D) Algorithm
Garner, Trevor W; May 11, 2006; 8 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0316
Report No.(s): AD-A448071; TL-SG-06-03; No Copyright; Avail.: CASI: A02, Hardcopy

This study incorporated virtual height traces measured by ionosondes directly into an objective analysis (OA) algorithm. The OA algorithms ingest available data sets to construct coherent maps that represent the larger scale behavior of the ionosphere. A forward model which calculates the virtual height profile form a given electron density distribution was developed and incorporated into the Ionospheric Data Assimilation Three Dimensional (IDA3D) OA algorithm. In addition, IDA3D was modified to ingest nonlinear observations. Initial tests of the modified IDA3D indicate a good fit between the IDA3D predictions of the virtual height to the observed virtual heights. The IDA3D electron density profiles agree well with the electron densities calculated by a state-of-the-art digisonde inversion algorithm. In addition, the valley region between the E and F layers is generated in IDA3D by incorporating the virtual height traces.
DTIC
Algorithms; Assimilation; Electron Density (Concentration); Ionosondes; Ionospheres

20060022157 NASA Ames Research Center, Moffett Field, CA, USA
Drilling Automation Demonstrations in Subsurface Exploration for Astrobiology
Glass, Brian; Cannon, H.; Lee, P.; Hanagud, S.; Davis, K.; [2006]; 1 pp.; In English; Astrobiology Science Conference, 26-30 Mar. 2006, Washington, DC, USA; Copyright; Avail.: Other Sources; Abstract Only

This project proposes to study subsurface permafrost microbial habitats at a relevant Arctic Mars-analog site (Haughton Crater, Devon Island, Canada) while developing and maturing the subsurface drilling and drilling automation technologies that will be required by post-2010 missions. It builds on earlier drilling technology projects to add permafrost and ice-drilling capabilities to 5m with a lightweight drill that will be automatically monitored and controlled in-situ. Frozen cores obtained with this drill under sterilized protocols will be used in testing three hypotheses pertaining to near-surface physical geology and ground H2O ice distribution, viewed as a habitat for microbial life in subsurface ice and ice-consolidated sediments. Automation technologies employed will demonstrate hands-off diagnostics and drill control, using novel vibrational dynamical analysis methods and model-based reasoning to monitor and identify drilling fault states before and during faults. Three field deployments, to a Mars-analog site with frozen impact crater fallback breccia, will support science goals, provide a rigorous test of drilling automation and lightweight permafrost drilling, and leverage past experience with the field site s particular logistics.
Author
Drilling; Microorganisms; Permafrost; Geology; Water; Ice; Logistics

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20060021810 Massachusetts Inst. of Tech., Cambridge, MA USA
Investigations of Scalar Transfer Coefficients in Fog During the Coupled Boundary Layers and Air-Sea Transfer Experiment: A Case Study
Crofoot, Robert F; Sep 2004; 72 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447905; No Copyright; Avail.: CASI: A04, Hardcopy

The uncertainty in the determination of the momentum and scalar fluxes remains one of the main obstacles to accurate numerical forecasts in low to moderate wind conditions. For example, latent heat fluxes computed from data using direct covariance and bulk aerodynamic methods show that there is good agreement in unstable conditions when the latent heat flux values are generally positive. However, the agreement is relatively poor in stable conditions, particularly when the moisture flux is directed downward. If the direct covariance measurements are indeed accurate, then they clearly indicate that the bulk

aerodynamic formula overestimate the downward moisture flux in stable conditions. As a result, comparisons of the Dalton number for unstable and stable conditions indicate a marked difference in value between the two stability regimes. Investigations done for this thesis used data taken primarily at the Air-Sea Interaction Tower (ASIT) during the Coupled Boundary Layers and Air-Sea Transfer (CBLAST) Experiment 2003 from the 20-27 August 2003. Other data from the shore based Martha's Vineyard Coastal Observatory (MVCO) and moored buoys in the vicinity of the ASIT were also incorporated. During this eight day period, the boundary layer was often characterized by light winds, a stably stratified surface layer and a swell dominated wave field. Additionally, the advection of warm moist air over cooler water resulted in fog formation and a downward flux of moisture on at least three occasions. Therefore, a primary objective of this thesis is to present a case study to investigate the cause of this shortcoming in the bulk formula under these conditions by examining the physical processes that are unique to these boundary layers.
DTIC
Air Water Interactions; Boundary Layers; Coefficients; Fog; Scalars

20060021827 Johns Hopkins Univ., Laurel, MD USA
The Integrated Natural Environment Authoritative Representation Process
Weitzner, Edward F; Jun 23, 2005; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447929; No Copyright; Avail.: CASI: A03, Hardcopy

Presentation on the integrated natural environment authoritative representation process. A brief on some of the relevant aspects of providing an authoritative natural environment to models and simulations.
DTIC
Environments; Models

51
LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

20060021640 Texas Univ., Houston, TX USA
Epigenetic Silencing and Resistance to Imatinib Mesylate in CML
Issa, Jean-Pierre; Jul 2005; 22 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0448
Report No.(s): AD-A447574; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447574; Avail.: CASI: A03, Hardcopy

Resistance to Imatinib mesylate is emerging as a real clinical problem in the management of chronic myelogenous leukemia (CML). In this project, we are exploring the hypothesis that epigenetic silencing associated with promoter DNA methylation mediates resistance in selected cases, and that reversal of silencing by decitabine-induced hypomethylation can be of therapeutic benefit in CML. In progress to date, we have identified samples from patients with CML prior to Imatinib therapy, as well as from patients with established resistance to Imatinib. Bisulfite based analysis identified methylation of p15 and CDH13 in subsets of patients but ruled these genes out as major causes of resistance. In parallel, clinical trials of decitabine have shown activity as single agent and when combined with Imatinib in CML resistant to Imatinib. Analysis of samples from patients on trial showed hypomethylation after therapy. Flypomethylation dynamics suggest that decitabine leads to CML cell death 5-10 days after treatment and suggest that resistance to decitabine is not pharmacologic. These studies are ongoing to clarify the role of methylation in the pathogenesis and therapy of Imatinib resistant CML.
DTIC
Genetics; Leukemias

20060021642 Minnesota Univ., Minneapolis, MN USA
A Model DoD Systems Approach for Tobacco Cessation
Lando, Harry A; Oct 2005; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0586
Report No.(s): AD-A447593; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447593; Avail.: CASI: A03, Hardcopy

Military personnel have a smoking rate of approximately 30%, and recent evidence indicates this rate is no longer decreasing. Given the costs in terms of health care expenditures and decreased troop readiness, more must be done to decrease smoking in the military. The primary objective of the study is to evaluate whether implementation of a specialized intervention program based on the recommendations of the DoD Tobacco Cessation Policy Working Group and the VHA/DoD Clinical Practice Guidelines for tobacco interventions will result in lower smoking cessation rates among active duty personnel and TRICARE Prime beneficiaries (i.e., individuals who receive their medical care primarily from military installations). The project intervention combines state-of-the-art components from community trials with empirically supported clinical interventions to form a unique, comprehensive tobacco control program for military installations. Specifically, it focuses on three areas of intervention: expanding pharmacotherapy as a benefit, providing training to both medical and non-medical personnel regarding brief interventions with tobacco users, and using a social marketing approach to develop a targeted media campaign to reduce tobacco use among junior enlisted personnel.
DTIC
Military Personnel; Smoke; Tobacco

20060021644 Kimmel (Sidney) Cancer Center, San Diego, CA USA
Myeloid-Biased Stem Cells as Potential Targets for Chronic Myelogeneous Leukemia
Muller-Sieburg, Christa; Sep 2005; 8 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0798
Report No.(s): AD-A447669; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447669; Avail.: CASI: A02, Hard-copy

CML results from the malignant transformation of a pluripotent hematopoletic stem cell (HSC). We identified novel subsets of HSC, called Myeloid-biased (My-bi) HSC. These HSC are epigenetically programmed to generate progeny that is skewed towards the myeloid lineage. Thus, both the normal My-bi HSC and the transformed CML HSC generate a myeloidbiased progeny. Accordingly, we hypothesized that My-bi HSC are the target of transformation that can lead to CML. We are taking advantage of a mouse model for CML. We will isolate the different types of HSC that we have identified and will infect these with replication deficient retroviri containing the myeloid-associated p2lO form of the Bcr/Abl construct. If our hypothesis is correct, My-bi HSC, but not balanced or Ly-bi, HSC can be transformed to give rise to myelogenous leukemia. We have begun to generate clonally repopulated host animals and have identified linage biased HSC. We have also begun a series of experiments to define the conditions that will yield high titer retrovirus for the proposed studies. The proposed studies for the first time raise the possibility to selectively target My-bi HSC for therapy. This would leave other HSC untouched, limiting the toxicity of therapy.
DTIC
Bias; Leukemias; Stem Cells; Targets

20060021646 University of Western Michigan, Kalamazoo, MI USA
Early Detection of Prostate Cancer
Atashbar, Massood; Bejcek, Bruce E; Mar 2005; 62 pp.; In English
Report No.(s): AD-A447674; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447674; Avail.: CASI: A04, Hard-copy

Acoustic wave sensors have been widely used for detection of various chemical and biological species in liquid media. An improved binding of Protein A and IgG molecules on QCM biosensors by modifying the gold surface of the quartz crystal with a 35nm polystyrene film followed by an acidic treatment was accomplished. The frequency shifts due to the binding of the Protein A and IgG were 220 Hz and 282 Hz respectively for direct binding onto the chip. There was an appreciable increase in the frequency shift when the polystyrene film was used as an interfacial layer. The shift with the polystyrene film for Protein A was 364 Hz (an increase of 65%) and for the IgG it was 391 Hz (an increase of 40%). Complementary Atomic Force Microscopy (AFM) studies were carried out to understand the parameters responsible for such improved biomolecular binding. The CNT novel nanostructure material was used as chemical interface to enhance the sensitivity of the acoustic wave sensors which resulted in five fold increase in the frequency shift. Immobilization of the fPSA at different concentrations on gold surface was achieved and corresponding sensor response were registered.
DTIC
Cancer; Detection; Prostate Gland

20060021648 Office of the Deputy Secretary of Defense, Washington, DC USA

Advances in Biotechnology and Genetic Engineering: Implications for the Development of New Biological Warfare Agents

Jun 1996; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447681; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447681; Avail.: CASI: A03, Hard-copy

The conferees on the FY96 National Defense Authorization Conference noted with concern that the recent progress in biotechnology could potentially lead to the development of new biological warfare (BW) agents and capabilities among potential adversaries of the USA. This report provides information to the Congressional defense committees on: 1) the national security threats posed by such potential developments of new agents through advances in biotechnology and genetic engineering; 2) recommendations related to reducing the impact of progress in these areas; 3) the utility of increased emphasis on research and development of medical countermeasures related to mid-term or far-term biowarfare threat agents; and 4) other measures that could reduce the threat of these technological advances and reduce the threat of biological agent and weapons proliferation. Acquisition of biotechnology and biological weapons capabilities is considerably easier than was the case in the 1940s and 1950s. There has been an explosion in biotechnologies and genetic engineering technologies all of which have legitimate civilian applications which may enable proliferation. As Gordon Oehler, Director of DCI's Non-Proliferation Center, testified before the Senate Armed Services Committee, March 27, 1996, we see a continuing pursuit by many countries to acquire chemical and biological weapons. The chilling reality is that these materials and technologies are more accessible now than at any other time in history. This report focuses on these issues and provides the basis for more detailed discussion of funding and program priorities, particularly in the area of medical biological defense research.

DTIC

Biological Weapons; Biotechnology; Countermeasures; Genetic Engineering; Genetics

20060021649 British Columbia Cancer Research Centre, Victoria, British Columbia Canada

Eliciting Autoimmunity to Ovarian Tumors in Mice by Genetic Disruption of T Cell Tolerance Mechanisms

Nelson, Brad H; Aug 2005; 13 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0733

Report No.(s): AD-A447683; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447683; Avail.: CASI: A03, Hard-copy

Research in the fields of basic immunology and autoimmunity has identified several distinct mechanisms through which immune tolerance is established and maintained in the normal host, and additional mechanisms will likely be identified in future. We hypothesize that ovarian tumors are recognized in an antigen-specific manner by T cells but induce immunologic tolerance through one or more of these homeostatic mechanisms, which have evolved to protect the host from autoimmune attack. We further hypothesize that tolerance to ovarian tumors can be overcome by disrupting critical components of tolerogenic pathways through genetic manipulation of T cells. To test this hypothesis, we proposed to develop a murine model for ovarian cancer that will allow, for the first time, precise monitoring of the functional responses of naive, tumor-specific CD4+ and CD8+ T cell clones to ovarian tumors. Multiple properties of tumor-reactive T cells will be assessed in vivo, including their localization, activation, anergic status, proliferation and apoptosis. Differential responses and anti-tumor activities of the CD4+ and CD8+ T cell subsets will be investigated. Finally, the model will be used to evaluate the functional responses of tumor-specific CD4+ and CD8+ T cells that are genetically pre-disposed to autoimmune activity. The first tolerogenic pathway tested will be that involving the Cbl-b gene, as T cells lacking Cbl-b have a greatly reduced requirement for CD28 co-stimulation and demonstrate hyperactivity in vivo with profound autoimmune sequelae.

DTIC

Cancer; Diseases; Genetics; Immunity; Mice; Ovaries; Tumors

20060021663 Duke Univ., Durham, NC USA

Programme DNA Lattices: Design, Synthesis and Applications

Reif, John; Feb 2006; 74 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-01-2-0561; Proj-BIOC

Report No.(s): AD-A447708; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447708; Avail.: CASI: A04, Hard-copy

Programmable methods for construction of complex structured objects on the 10-100 nm scale. Self-assembled DNA nanostructures provide a methodology for bottom-up nanoscale construction of highly patterned systems, utilizing macromolecular DNA tiles' composed of branched DNA, self-assembled into periodic and aperiodic lattices. This

methodology is programmable by choice of the set of DNA tiles, and can form any computable 2D or 3D pattern. Work was done by three leading research groups in DNA lattices: Duke (Reif); NYU (Seeman); and Caltech (Winfree). These experimental techniques were extended to assemble DNA lattices with complex 2D patterning and periodic 3D DNA lattices for the first time. This provides a flexible nanostructure construction methodology. By selectively attaching various other types of molecules to the tiles of the lattices, these lattices can be used as superstructures for placement of nanocomponents composed of a wide variety of other materials. The ability to form programmable, patterned nanostructured DNA lattices, as demonstrated for the first time in this project, opens many key opportunities for applied research in nanoscale science and engineering, including their application as scaffolds and superstructures for aligning proteins for crystallography studies, molecular electronics and nanorobotics.
DTIC
Deoxyribonucleic Acid; Nanostructures (Devices)

20060021723 Texas Univ. Health Science Center, San Antonio, TX USA
Identification of a Gene on Chromosome 18q21 Involved in Suppressing Metastatic Prostate Cancer
Johnson-Pais, Teresa R; Dec 2005; 45 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0044
Report No.(s): AD-A447814; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447814; Avail.: CASI: A03, Hard-copy

In metastatic prostate cancer there is increased frequency of loss of genetic material from chromosome 18q. We previously identified two regions on chromosome 18q as the potential sites of tumor suppressor genes involved in metastasis suppression. To identify these genes, we created custom bacterial artificial chromosome (BAC) microarrays containing the genomic sequence at 18q21-18q23. Analysis of 34 prostate tumors using array comparative genomic hybridization revealed gains and losses within this region. Transfection of the metastatic prostate cancer cell line PC-3 with BAC clones containing the maspin and NET01 genes results in altered in vitro growth properties. In vivo analysis of the metastatic potential of PC-3 cells transfected with maspin reveals that maspin is involved in the seeding of tumor cells to bone. Additionally, we have evidence that increased copy number of the cadherin-7 gene plays a role in prostate cancer tumorigenesis.
DTIC
Cancer; Chromosomes; Genes; Metastasis; Prostate Gland

20060021724 University of Central Florida, Orlando, FL USA
Prostasin's Role in Prostate Cancer
Chai, Karl; Chen, Limei; Dec 1, 2005; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0032
Report No.(s): AD-A447815; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447815; Avail.: CASI: A03, Hard-copy

We have shown, in an alternative model system (of the mouse bladder) via collaborative research, that prostasin serine protease is capable of attenuating LPS-induced inflammatory gene expression response, specifically the mRNA expression of inducible nitric oxide synthase (iNOS), by potentially intercepting cytokine signaling at the cytokine receptor level. A new candidate protein, gp13O, the signal transducer of the interleukin-6 receptor complex, has been proposed to be the 12O-13O-kDa tyrosinephosphorylated protein regulated by prostasin in the DU-145 and PC-3 cells, as presented in the original proposal. Efforts are underway to demonstrate the applicability of this new molecular mechanism in the prostate cancer cell line PC-3, which had been shown by others to respond to inflammatory challenges such as LPS and cytokines through upregulation of the iNOS gene expression, while over-expressing the gp13O signal transducer. This new working hypothesis directly related to the original proposal will potentially lead to better understanding of the role of inflammation in prostate cancer biology.
DTIC
Cancer; Diaphragms (Mechanics); Prostate Gland; Proteins

20060021732 Pennsylvania Univ., Philadelphia, PA USA
Hot Flashes Among Prostate Cancer Patients Undergoing Androgen Deprivation Therapy: Psychosocial and Quality of Life Issues
Coyne, James; Dec 2005; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0125
Report No.(s): AD-A447835; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447835; Avail.: CASI: A02, Hard-copy

Androgen deprivation therapy (ADT) is increasingly prescribed to patients with prostate cancer and brings with it an array of adverse effects. Hot flashes are a common side effect of ADT and are believed to be qualitatively similar to hot flashes among women receiving treatment for breast cancer. Currently no assessment protocols exist for objective assessments of hot flashes in prostate cancer patients, making it difficult to evaluate outcomes in clinical trials, educate clinicians and patients, or develop management and treatment strategies. This project will provide basic clinical epidemiological data concerning the nature, prevalence, and correlates of hot flashes among prostate patients receiving ADT, document the negative effects of hot flashes on sleep, fatigue, and quality of life, and compare the accuracy of alternative means of assessing hot flashes. The overarching goal is to not only understand the nature and importance of hot flashes, but to develop methodological standards for the assessment of hot flashes suitable to diverse applications. Results will have implications for the education of oncologists with respect to quality of life issues in prostate cancer, set standards for future research and clinical endeavors, and suggest directions for patient-oriented research to improve the wellbeing of prostate cancer patients.
DTIC
Cancer; Clinical Medicine; Deprivation; Epidemiology; Hormones; Males; Patients; Prostate Gland; Social Factors

20060021735 City of Hope Medical Center, Duarte, CA USA
In Vivo Imaging of mdrla Gene Expression
Synold, Timothy W; Jun 2005; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0461
Report No.(s): AD-A447839; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447839; Avail.: CASI: A03, Hard-copy

The authors' experience studying the MDR1 gene prompted them to initiate work on a novel animal model to study MDR1/mdr1 gene expression under a variety of normal and breast cancer-related physiological conditions. With the advent of new bioimaging technology and the advancement of efficient gene targeting strategies, they found an opportunity to apply these state-of-the-art molecular tools to their problem. The work performed with the support of this grant has enabled them to do the following: (1) engineer a targeting vector to allow insertion of a reporter (luciferase or HSV-tk) into the genomic locus of the mouse mdr1a gene; (2) create mouse embryonic stem cells in which a gene replacement/knock-in strategy was used to insert luciferase into the mouse mdr1a genomic locus; (3) demonstrate that luciferase expression in these cells requires Cre recombinase to bring luciferase in-frame with the translational start site of the mdr1a gene product; (4) show that the recombined configuration of mdr1/LUC, in its cDNA form, encodes a functional protein with luciferase activity; and (5) create both founder and Cre-recombinase expressing mouse strains for use in in vivo imaging experiments. Work performed to date has proved the feasibility of this approach. However, further refinements to the model are required.
DTIC
Breast; Cancer; Enzymes; Gene Expression; Genes; Images; Imaging Techniques; In Vivo Methods and Tests; Mammary Glands; Stem Cells; Target Acquisition

20060021737 Creighton Univ., Omaha, NE USA
Ethnic and Environmental Influence on Vitamin D Requirement in Military Personnel
Heaney, Robert P; Oct 2005; 12 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0818
Report No.(s): AD-A447844; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447844; Avail.: CASI: A03, Hard-copy

The purposes of this study are to provide quantitative estimates of 1) the effective amount of vitamin D produced in the skin as a function of skin pigmentation; and 2) the rate of utilization of vitamin D as a function of ethnicity. The outcome will be estimates of the amount of vitamin D that must be given orally to military personnel of different races and in different assigned locations so as to ensure and maintain normal vitamin D status. In the first 39 months' work (the period covered by this report), we have accumulated 8O+% of the targeted specimens for both objectives, in a racially diverse sample. In addition we have augmented our findings from naturally sun-exposed individuals to include responses in volunteers receiving controlled doses of UV-B. Analyses are continuing and will be completed within the coming months. No final quantitative results will be available until all the measurements have been made and analyzed as a unit.
DTIC
Calciferol; Ethnic Factors; Military Personnel; Pigments

20060021804 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Postexposure Protection Against Marburg Haemorrhagic Fever with Recombinant Vesicular Stomatitis Virus Vectors in Non-Human Primates: An Efficacy Assessment

Daddario-DiCaprio, Kathleen M; Geisbert, Thomas W; Stroher, Ute; Geisbert, Joan B; Grolla, Allen; Fritz, Elizabeth A; Fernando, Usa; Kagan, Elliott; Jahrling, Peter B; Hensley, Lisa E; Jones, Steven M; Feldmann, Heinz; Apr 29, 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447898; No Copyright; Avail.: CASI: A02, Hardcopy

Effective countermeasures are urgently needed to prevent and treat infections caused by highly pathogenic and biological threat agents such as Marburg virus (MARV). We aimed to test the efficacy of a replication-competent vaccine based on attenuated recombinant vesicular stomatitis virus (rVSV), as a postexposure treatment for MARV haemorrhagic fever. We used a rhesus macaque model of MARV haemorrhagic fever that produced 100% lethality. We administered rVSV vectors expressing the MARV Musoke strain glycoprotein to five macaques 20-30 min after a high-dose lethal injection of homologous MARV. Three animals were MARV-positive controls and received non-specific rVSV vectors. We tested for viraemia, undertook analyses for haematology and serum biochemistry, and measured humoral and cellular immune responses. All five rhesus monkeys that were treated with the rVSV MARV vectors as a postexposure treatment survived a high-dose lethal challenge of MARV for at least 80 days. None of these five animals developed clinical symptoms consistent with MARV haemorrhagic fever. All the control animals developed fulminant disease and succumbed to the MARV challenge by day 12. MARV disease in the controls was indicated by: high titres of MARV (10(3)-10(5) plaque-forming units per mL); development of leucocytosis with concurrent neutrophilia at end-stage disease; and possible damage to the liver, kidney, and pancreas. Postexposure protection against MARV in non-human primates provides a paradigm for the treatment of MARV haemorrhagic fever. Indeed, these data suggest that rVSV-based filoviral vaccines might not only have potential as preventive vaccines, but also could be equally useful for postexposure treatment of filoviral infections.

DTIC

Fever; Hemorrhages; Protection; Viruses

20060021805 Colorado Univ., Aurora, CO USA

Signaling Pathways that Mediate Neurotoxin-Induced Death of Dopamine Neurons

Heidenreich, Kim; Linseman, Dan A; Nov 2005; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0001

Report No.(s): AD-A447899; No Copyright; Avail.: CASI: A02, Hardcopy

Parkinson's disease (PD) is characterized by progressive loss of dopaminergic neurons in the nigrostriatal pathway resulting in significant motor dysfunction. The pathology of PD is mimicked by exposure to 1-methyl-4-phenyl-1 ,2,3,tetrahydropyridine (MPTP) or the pesticide rotenone. These neurotoxins inhibit complex I of the mitochondrial respiratory chain resulting in the production of reactive oxygen species (ROS) and increased cytosolic calcium. We hypothesize that ROS promotes opening of the mitochondrial permeability transition pore which triggers the death pathway. In parallel, increases in cytosolic calcium leads to oxidative stress and activation of c-Jun-NH2-terminal kinase (JNK). JNK/c-Jun signaling augments activation of the mitochondrial apoptotic cascade by suppressing Bcl-2 pro-survival signals via phosphorylation of Bcl-2 or transcription of the BH3-only, Bcl-2 antagonist Bim. The interactions between the oxidative stress pathway, the JNK/c-Jun signaling cascade, and the mitochondrial apoptotic machinery ultimately determine the fate of dopamine neurons. We will utilize primary ventral mesencephalic cultures obtained from E15 embryonic rats to investigate our hypothesis. The data obtained should lead to the identification of promising therapeutic strategies to slow or halt the dopaminergic neurodegeneration that occurs during progression of PD.

DTIC

Death; Diseases; Dopamine; Neurons

20060021814 Army Medical Research Inst. of Chemical Defense, Aberdeen Proving Ground, MD USA

TNF-alpha Expression Patterns as Potential Molecular Biomarker for Human Skin Cells Exposed to Vesicant Chemical Warfare Agents: Sulfur Mustard (HD) and Lewisite (L)

Arroyo, C M; Burman, D L; Kahler, D W; Nelson, M R; Corun, C M; Guzman, J J; Smith, M A; Purcell, E D; Hackley, Jr , B E; Soni, S; Jan 2004; 16 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447912; USAMRICD-P03-045; No Copyright; Avail.: CASI: A03, Hardcopy

Studies were conducted to examine the effect of two vesicant chemical warfare agents (VCWA), one of them an arsenical, on cytokine gene expression in normal human epidermal keratinocyte (NHEK) cells. We tested 2,2'-dichlorethylsulfide (sulfur mustard, military designation HD) and 2,chlorovinyldichloroarsine (Lewisite, military designation L), which have significant

differences in their chemical, physical, and toxicological properties. Human tumor necrosis factor-alpha (hTNF-alpha cytokine was detected by using the enzyme-linked immunosorbent assay, a protein multiplex immunoassay, Luminex100(Trade mark), and reverse transcription-polymerase chain reaction (RT-PCR). The messenger RNA expression of hTNF-alpha was determined to provide a semi-quantitative analysis. HD-stimulated NHEK induced secretion of hTNF-alpha in a dose-dependent manner. Dose response effect of Lewisite decreased hTNF-alpha levels. Time-response data indicated that the maximum response for HD occurred at 24 h with an associated cytotoxic concentration of 10(exp -4) mol/L. NHEK cells stimulated with 10(exp -4) mol/ LHD for 24 h at 37 degrees C increased detectable levels of hTNF-alpha from 5 to 28 ng/ml at an index of cell viability between 85 to 93% as detected by Luminex100(Trade Mark). Our results indicated that the increased levels of hTNF-alpha by HD are dependent on the primary cultures, cell densities, and chemical properties of the stimulation. Lewisite under the same conditions as HD caused a reduction of hTNF-alpha from control levels of 1.5 ng/ml to 0.3 ng/ml after stimulation (10 (exp -4) mol/L), with an index of cell viability of ~34%. We analyzed the transcriptional of hTNF-alpha gene and found that HD (10(exp -6) to 10(exp -4) mol/L) activates the hTNF-alpha gene in cultured NHEK and that L at 10(exp 6) to 10(exp -4) mol/L markedly reduces the hTNF-alpha gene.
DTIC
Biomarkers; Chemical Warfare; Skin (Anatomy); Sulfur

20060021831 Defense Communications Agency, Washington, DC USA
National Strategy for Pandemic Influenza Implementation Plan
May 2006; 233 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447939; No Copyright; Avail.: CASI: A11, Hardcopy

Influenza viruses have threatened the health of animal and human populations for centuries. Their diversity and propensity for mutation have thwarted our efforts to develop both a universal vaccine and highly effective antiviral drugs. A pandemic occurs when a novel strain of influenza virus emerges that has the ability to infect and be passed between humans. Because humans have little immunity to the new virus, a worldwide epidemic, or pandemic, can ensue. Three human influenza pandemics occurred in the 20th century, each resulting in illness in approximately 30 percent of the world population and death in 0.2 percent to 2 percent of those infected. Using this historical information and current models of disease transmission, it is projected that a modern pandemic could lead to the deaths of 200,000 to 2 million people in the USA alone. The animal population serves as a reservoir for new influenza viruses. Scientists believe that avian, or bird, viruses played a role in the last three pandemics. The current concern for a pandemic arises from an unprecedented outbreak of H5N1 influenza in birds that began in 1997 and has spread across bird populations in Asia, Europe, and Africa. The virus has shown the ability to infect multiple species, including long-range migratory birds, pigs, cats, and humans. It is impossible to predict whether the H5N1 virus will lead to a pandemic, but history suggests that if it does not, another novel influenza virus will emerge at some point in the future and threaten an unprotected human population. The economic and societal disruption of an influenza pandemic could be significant. Absenteeism across multiple sectors related to personal illness, illness in family members, fear of contagion, or public health measures to limit contact with others could threaten the functioning of critical infrastructure, the movement of goods and services, and operation of institutions such as schools and universities.
DTIC
Health; Infectious Diseases; Influenza; Security; Viruses

20060021836 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
A Multivariate Analysis of Factors Associated With Differential Disease and Nonbattle Injury and Morbidity Aboard Ships of the U.S. Naval 5th Fleet During Peacetime Deployment
Riddle, Mark S; Sherman, Sterling S; Kilbane, Edward M; Putnam, Shannon D; Oct 2004; 9 pp.; In English
Report No.(s): AD-A447946; No Copyright; Avail.: CASI: A02, Hardcopy

Disease nonbattle injury (DNBI) surveillance is a critical component of U.S. military force health protection and has been aggressively implemented by the U.S. Central Command. This study presents a multivariate analysis of factors associated with DNBI incidence rates as well as a description of morbidity measures associated with DNBI from U.S. Navy ships deployed to the Middle East from October 2000 through September 2001. Weekly DNBI reports (N = 331) from a total of 44 individual units representing six different classes of U.S. Navy ships were included in the analysis. There were statistically significant differences in summary and categorical DNBI rates associated with ship class, season, and presence of female sailors embarked. The top three DNBI categories associated with the most lost workdays because of sick in quarters and hospitalization were other medical/surgical (36%), infectious gastrointestinal (23%), and all types of nonbattle injury combined (17%).
DTIC
Deployment; Diseases; Injuries; Medical Services; Military Operations; Multivariate Statistical Analysis; Peacetime

20060021838 Walter Reed Army Inst. of Research, Silver Spring, MD USA

Production of the Subdomains of the Plasmodium falciparum Apical Membrane Antigen 1 Ectodomain and Analysis of the Immune Response

Lalitha, P V; Ware, Lisa A; Barbosa, Arnoldo; Dutta, Sheetij; Moch, J K; Haynes, J D; Fileta, Bader B; White, Charles E; Lanar, David E; Aug 2004; 8 pp.; In English

Report No.(s): AD-A447949; No Copyright; Avail.: CASI: A02, Hardcopy

The apical membrane antigen 1 of Plasmodium falciparum is one of the leading candidate antigens being developed as a vaccine to prevent malaria. This merozoite transmembrane protein has an ectodomain that can be divided into three subdomains (D I, D II, and D III). We have previously expressed a major portion of this ectodomain and have shown that it can induce antibodies that prevent merozoite invasion into red blood cells in an in vitro growth and invasion assay. To analyze the antibody responses directed against the individual subdomains, we constructed six different genes that express each of the domains separately (D I, D II, or D III) or in combination with another domain (D I II, D II III, or D I III). These proteins were purified and used to immunize rabbits to raise construct-specific antibodies. We demonstrated that D I II induced a significant amount of the growth-inhibitory antibodies active in the growth and invasion assay.

DTIC

Antigens; Immune Systems; Immunity; Membranes; Parasitic Diseases; Physiological Responses; Vaccines

20060021840 University of South Florida, Tampa, FL USA

Attenuation of Dengue Virus Infection by Adeno-Associated Virus-Mediated siRNA Delivery

Zhang, Weidong; Singam, Rajeswari; Hellermann, Gary; Kong, Xiaoyuan; Juan, Homero S; Lockey, Richard F; Wu, Shuen-Ju; Porter, Kevin; Mohapatra, Shyam S\g; Aug 9, 2004; 11 pp.; In English

Report No.(s): AD-A447952; No Copyright; Avail.: CASI: A03, Hardcopy

Background: The need for safe and effective treatment of dengue virus (DEN), a class A agent that causes dengue hemorrhagic fever/dengue shock syndrome, has been a critical global priority. An effective vaccine for DEN is not yet available. In this study the possibility of attenuating DEN infection using adeno-associated virus (AAV)-encoded short interfering RNAs (siRNA) was examined in Vero cells and human dendritic cells (DCs). Methods: A cassette encoding siRNA targeted to a 3' untranslated sequence common to all DEN serotypes was designed and tested for its ability to attenuate DEN infection by use of AAV delivery. Results: Vero cells or DCs infected with AAV-siRNA showed a significant, dose-dependent reduction in DEN infection. Treatment of DCs with AAV-siRNA also decreased the DEN-induced apoptosis of DCs and did not induce significant inflammation. Conclusion: These results demonstrate that AAV-mediated siRNA delivery is capable of reducing DEN infection in cells and may be useful in decreasing DEN replication in humans.

DTIC

Infectious Diseases; Ribonucleic Acids; Vaccines; Viral Diseases; Viruses

20060021841 Naval Submarine Medical Research Lab., Groton, CT USA

A Spontaneous Translational Fusion of Bacillus cereus PlcR and PapR Activates Transcription of PlcR-Dependent Genes in Bacillus anthracis via Binding With a Specific Palindromic Sequence

Pomerantsev, Andrei P; Pomerantseva, Olga M; Leppla, Stephen H; Oct 2004; 11 pp.; In English

Report No.(s): AD-A447953; No Copyright; Avail.: CASI: A03, Hardcopy

Transformation of Bacillus anthracis with plasmid pUTE29-plcR-papR carrying the native Bacillus cereus plcR-papR gene cluster did not activate expression of B. anthracis hemolysin genes, even though these are expected to be responsive to activation by the global regulator PlcR. To further characterize the action of PlcR, we examined approximately 3,000 B. anthracis transformants containing pUTE29-plcR-papR and found a single hemolytic colony. The hemolytic strain contained a plasmid having a spontaneous plcR-papR intergenic region deletion. Transformation of the resulting plasmid pFP12, encoding a fused PlcR-PapR protein, into the nonhemolytic B. anthracis parental strain produced strong activation of B. anthracis hemolysins, including phosphatidylcholine-specific phospholipase C and sphingomyelinase. The fused PlcR-PapR protein present in a lysate of B. anthracis containing pFP12 bound strongly and specifically to the double-stranded palindrome 5 -TATGCATTATTTCATA-3 that matches the consensus PlcR-binding site. In contrast, native PlcR protein in a lysate from a B. anthracis strain expressing large amounts of this protein did not demonstrate binding with the palindrome. The results suggest that the activation of PlcR by binding of a PapR pentapeptide as normally occurs in Bacillus thuringiensis and B. cereus can be mimicked by tethering the peptide to PlcR in a translational fusion, thereby obviating the need for PapR secretion, extracellular processing, retrieval into the bacterium, and binding with PlcR.

DTIC

Bacillus; Genes

20060021846 Naval Submarine Medical Research Lab., Groton, CT USA

N-Linked Protein Glycosylation is Required for Full Competence in Campylobacter jejuni 81-176

Larsen, Joseph C; Szymanski, Christine; Guerry, Patricia; Oct 2004; 8 pp.; In English

Report No.(s): AD-A447959; No Copyright; Avail.: CASI: A02, Hardcopy

The recent sequencing of the virulence plasmid of Campylobacter jejuni 81-176 revealed the presence of genes homologous to type IV secretion systems (TFSS) that have subsequently been found in Helicobacter pylori and Wolinella succinogenes. Mutational analyses of some of these genes have implicated their involvement in intestinal epithelial cell invasion and natural competence. In this report, we demonstrate that one of these type IV secretion homologs, Cjp3/VirB10, is a glycoprotein. Treatment with various glycosidases and binding to soybean agglutinin indicated that the structure of the glycan present on VirB10 contains a terminal GalNAc, consistent with previous reports of N-linked glycans in C. jejuni. Site-directed mutagenesis of five putative N-linked glycosylation sites indicated that VirB10 is glycosylated at two sites, N32 and N97. Mutants in the N-linked general protein glycosylation (pgl) system of C. jejuni are significantly reduced in natural transformation, which is likely due, in part, to lack of glycosylation of VirB10. The natural transformation defect in a virB10 mutant can be complemented in trans by using a plasmid expressing wild-type VirB10 or an N32A substitution but not by using a mutant expressing VirB10 with an N97A substitution. Taken together, these results suggest that glycosylation of VirB10 specifically at N97 is required for the function of the TFSS and for full competence in C. jejuni 81-176.

DTIC

Proteins

20060021847 Scripps Research Inst., La Jolla, CA USA

Molecular Dissection of the Human Antibody Response to the Structural Repeat Epitope of Plasmodium falciparum sporozoite from a Protected Donor

Chappel, Jonathan A; Rogers, William O; Hoffman, Stephen L; Kang, Angray S; Jul 29, 2004; 13 pp.; In English

Contract(s)/Grant(s): DAAL03-92-G-0215

Report No.(s): AD-A447960; No Copyright; Avail.: CASI: A03, Hardcopy

The circumsporozoite surface protein is the primary target of human antibodies against Plasmodium falciparum sporozoites, these antibodies are predominantly directed to the major repetitive epitope (Asn-Pro-Asn-Ala)n, (NPNA)n. In individuals immunized by the bites of irradiated Anopheles mosquitoes carrying P. falciparum sporozoites in their salivary glands, the antirepeat response dominates and is thought by many to play a role in protective immunity.

DTIC

Antibodies; Antigens; Bacteriophages; Dissection; Human Reactions; Immune Systems; Immunity; Physiological Responses

20060021848 Naval Medical Research Center, Silver Spring, MD USA

MICs of Selected Antibiotics for Bacillus anthracis, Bacillus cereus, Bacillus thuringiensis, and Bacillus mycoides From a Range of Clinical and Environmental Sources as Determined by the Etest

Turnbull, Peter C; Sirianni, Nicky M; LeBron, Carlos I; Samaan, Marian N; Sutton, Felicia N; Reyes, Anatalio E; Peruski ,Jr, Leonard F; Aug 2004; 10 pp.; In English

Report No.(s): AD-A447963; No Copyright; Avail.: CASI: A02, Hardcopy

This paper presents Etest determinations of MICs of selected antimicrobial agents for 76 isolates of Bacillus anthracis chosen for their diverse histories and 67, 12, and 4 cultures, respectively, of its close relatives B. cereus, B. thuringiensis, and B. mycoides derived from a range of clinical and environmental sources. NCCLS breakpoints are now available for B. anthracis and ciprofloxacin, penicillin, and tetracycline; based on these breakpoints, the B. anthracis isolates were all fully susceptible to ciprofloxacin and tetracycline, and all except four cultures, three of which had a known history of penicillin resistance and were thought to originate from the same original parent, were susceptible to penicillin. Based on NCCLS interpretive standards for grampositive and/or aerobic bacteria, all cultures were susceptible to amoxicillin-clavulanic acid and gentamicin and 99% (one with intermediate sensitivity) of cultures were susceptible to vancomycin. No group trends were apparent among the different categories of B. cereus (isolates from food poisoning incidents and nongastrointestinal infections and food and environmental specimens not associated with illness). Differences between B. anthracis and the other species were as expected for amoxicillin and penicillin, with all B. anthracis cultures, apart from the four referred to above, being susceptible versus high proportions of resistant isolates for the other three species. Four of the B. cereus and one of the B. thuringiensis cultures were resistant to tetracycline and a further six B. cereus and one B. thuringiensis cultures fell into the intermediate category. There was a slightly higher resistance to azithromycin among the B. anthracis strains than for the other

species. The proportion of B. anthracis strains fully susceptible to erythromycin was also substantially lower than for the other species, although just a single B. cereus strain was fully resistant.
DTIC
Antibiotics; Antiinfectives and Antibacterials; Bacillus; Infectious Diseases; Microorganisms; Tetracyclines

20060021857 Vical, Inc., San Diego, CA USA
A Cationic Lipid-Formulated Plasmid DNA Vaccine Confers Sustained Antibody-Mediated Protection Against Aerosolized Anthrax Spores
Hermanson, G; Whitlow, V; Parker, S; Tonsky, K; Rusalov, D; Ferrari, M; Lalor, P; Komai, M; Mere, R; Bell, M; Sep 14, 2004; 7 pp.; In English
Contract(s)/Grant(s): 1R41AI054060-01
Report No.(s): AD-A447978; No Copyright; Avail.: CASI: A02, Hardcopy

DNA vaccines provide an attractive technology platform against bioterrorism agents due to their safety record in humans and ease of construction, testing, and manufacture. We have designed monovalent and bivalent anthrax plasmid DNA (pDNA) vaccines encoding genetically detoxified protective antigen (PA) and lethal factor (LF) proteins and tested their immunogenicity and ability to protect rabbits from an aerosolized inhalation spore challenge. Immune responses after two or three injections of cationic lipidformulated PA, PA plus LF, or LF pDNAs were at least equivalent to two doses of anthrax vaccine adsorbed (AVA). High titers of anti-PA, anti-LF, and neutralizing antibody to lethal toxin (Letx) were achieved in all rabbits. Eight or nine animals in each group were challenged with 100 LD50 of aerosolized anthrax spores 5 or 9 weeks after vaccination. An additional 10 animals vaccinated with PA pDNA were challenged \g7 months postvaccination. All animals receiving PA or PA plus LF pDNA vaccines were protected. In addition, 5 of 9 animals receiving LF pDNA survived, and the time to death was significantly delayed in the others. Groups receiving three immunizations with PA or PA plus LF pDNA showed no increase in anti-PA, anti-LF, or Letx neutralizing antibody titers postchallenge, suggesting little or no spore germination. In contrast, titer increases were seen in AVA animals, and in surviving animals vaccinated with LF pDNA alone. Preclinical evaluation of this cationic lipid-formulated bivalent PA and LF vaccine is complete, and the vaccine has received U.S. Food and Drug Administration Investigational New Drug allowance.
DTIC
Aerosols; Antibodies; Deoxyribonucleic Acid; Infectious Diseases; Lipids; Plasmids; Protection; Spores; Vaccines

20060021858 Virginia Commonwealth Univ., Richmond, VA USA
Preliminary Studies Examining Near Ultraviolet Fluorescence and Raman Spectroscopy for Tissue Interrogation of Shock
Terner, James; Dec 31, 2005; 5 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0344
Report No.(s): AD-A447979; No Copyright; Avail.: CASI: A01, Hardcopy

Non-invasive methods for the measurement of tissue oxygen saturation have long been sought for the detection of impending shock and the adequacy of resuscitation. Current methods such as those that require insertion of a catheter into the pulmonary artery or superior vena cava have attendant risks to the patient. Gastric tonometry, though considered to be minimally invasive, still requires insertion of a nasogastric tube into the stomach. We have found that we can obtain resonance Raman and fluorescence signals from the sublingual surface of the tongue in laboratory animals in a non-invasive manner, that correlate with lactate and oxygenation measurements of blood withdrawn by central venous catheterization. The resonance Raman measurements monitor hemoglobin oxygenation. The fluorescence measurements monitor NADH levels. In addition to being noninvasive the measurements are selective against contaminating signals from myoglobin in deep tissue. Even with low powered laser excitation the resonance Raman signals are quite strong, and both methods are adaptable for use with portable fiber optic components.
DTIC
Arteries; Cannulae; Ear; Fluorescence; Insertion; Interrogation; Oxygen; Raman Spectroscopy; Shock (Physiology); Ultraviolet Spectroscopy

20060021864 Naval Medical Research Center, Silver Spring, MD USA

A Small Peptide (CEL-1000) Derived from the Beta-Chain of the Human Major Histocompatibility Complex Class II Molecule Induces Complete Protection Against Malaria in an Antigen-Independent Manner

Charoenvit, Yupin; Brice, Gary T; Bacon, David; Majam, Victoria; Williams, Jackie; Abot, Esteban; Ganeshan, Harini; Sedegah, Martha; Doolan, Denise L; Carucci, Daniel J; Zimmerman, Daniel H; Jul 2004; 10 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447988; No Copyright; Avail.: CASI: A02, Hardcopy

CEL-1000 (DGQEEKAGVVSTGLIGGG) is a novel potential preventative and therapeutic agent. We report that CEL-1000 confers a high degree of protection against Plasmodium sporozoite challenge in a murine model of malaria, as shown by the total absence of blood stage infection following challenge with 100 sporozoites (100% protection) and by a substantial reduction (400-fold) of liver stage parasite RNA following challenge with 50,000 sporozoites. CEL-1000 protection was demonstrated in A/J (H-2a) and C3H/HeJ (H-2k) mice but not in BALB/c (H-2d) or CAF1 (A/J BALB/c F1 hybrid) mice. In CEL-1000-treated and protected mice, high levels of gamma interferon (IFN-) in serum and elevated frequencies of hepatic and splenic CD4 IFN- - positive T cells were detected 24 h after administration of an additional dose of CEL-1000. Treatment of A/J mice that received CEL-1000 with antibodies against IFN- just prior to challenge abolished the protection, and a similar treatment with antibodies against CD4 T cells partially reduced the level of protection, while treatment with control antibodies or antibodies specific for interleukin-12 (IL-12), CD8 T cells, or NK cells had no effect. Our data establish that the protection induced by CEL-1000 is dependent on IFN- and is partially dependent on CD4 T cells but is independent of CD8 T cells, NK cells, and IL-12 at the effector phase and does not induce a detectable antibody response. DTIC

Antigens; Clinical Medicine; Lymphocytes; Parasitic Diseases; Peptides; Protection; Vaccines

20060021865 Heriot-Watt Univ., Edinburgh, UK

Population Structure and Evolution of the Bacillus cereus Group

Priest, Fergus G; Barker, Margaret; Baillie, Les W; Holmes, Edward C; Maiden, Martin C; Dec 2004; 13 pp.; In English

Report No.(s): AD-A447991; No Copyright; Avail.: CASI: A03, Hardcopy

Representative strains of the Bacillus cereus group of bacteria, including Bacillus anthracis (11 isolates), B. cereus (38 isolates), Bacillus mycoides (1 isolate), Bacillus thuringiensis (53 isolates from 17 serovars), and Bacillus weihenstephanensis (2 isolates) were assigned to 59 sequence types (STs) derived from the nucleotide sequences of seven alleles, glpF, gmk, ilvD, pta, pur, pycA, and tpi. Comparisons of the maximum likelihood (ML) tree of the concatenated sequences with individual gene trees showed more congruence than expected by chance, indicating a generally clonal structure to the population. The STs followed two major lines of descent. Clade 1 comprised B. anthracis strains, numerous B. cereus strains, and rare B. thuringiensis strains, while clade 2 included the majority of the B. thuringiensis strains together with some B. cereus strains. Other species were allocated to a third, heterogeneous clade. The ML trees and split decomposition analysis were used to assign STs to eight lineages within clades 1 and 2. These lineages were defined by bootstrap analysis and by a preponderance of fixed differences over shared polymorphisms among the STs. Lineages were named with reference to existing designations: Anthracis, Cereus I, Cereus II, Cereus III, Kurstaki, Sotto, Thuringiensis, and Tolworthi. Strains from some B. thuringiensis serovars were wholly or largely assigned to a single ST, for example, serovar aizawai isolates were assigned to ST-15, serovar kenyae isolates were assigned to ST-13, and serovar tolworthi isolates were assigned to ST-23, while other serovars, such as serovar canadensis, were genetically heterogeneous. We suggest a revision of the nomenclature in which the lineage and clone are recognized through name and ST designations in accordance with the clonal structure of the population.

DTIC

Bacillus; Infectious Diseases; Populations

20060021872 Army Research Inst. of Environmental Medicine, Natick, MA USA

Effect of Potential Vesicant Antagonist Drugs on White Blood Cell Metabolic Activity in Human Whole Blood Exposed to 2-Chloroethyl Ethyl Sulfide

DuBose, David A; Blaha, Michael D; Morehouse, David H; Okun, Nelya; Hill, Craig; Jul 2004; 13 pp.; In English

Report No.(s): AD-A448006; No Copyright; Avail.: CASI: A03, Hardcopy

Mustard agent affects several pathways that involve calcium poisoning and protein degradation, but it is not clear how these pathways affect vesicant-induced toxicity. This makes it difficult to develop a good screening test to evaluate chemicals which might be used to antagonize or mitigate mustard's actions in cells. We examined here a screening test that uses live human tissue (human whole blood) and describe how monitoring the tissue after exposure to potential drugs and a vesicant can be used to estimate the overall effect of a drug or combination of drugs on vesicant exposure. Antagonizing cell death

pathways of calcium poisoning (zaldaride maleate [CGS9343B]; C) or protein degradation (Leupeptin; L) does not satisfactorily resolve vesicant-induced toxicity. However, antagonizing pathways simultaneously might be successful. Moreover, when used with an oxidizing agent (copper-based polyoxometalate; P) that may reduce vesicant toxicity, the effectiveness of these antagonists might be improved. This approach was evaluated using a simple human whole blood (HWB) in vitro system. Prior treatment (30 min) of heparinized (40 U/mL) HWB (n=9) without (buffer vehicle) or with C (13.6 microgram/mL), L (0.5 mg/mL) or P (5.0 microgram/mL) singly (N=3) or in combination (N=4) was tested for white blood cell metabolic activity (WBCMA; Intergen ProCheck[R]) post (24 h of in vitro culture) carrier (air) gas or vesicant (2-chloroethyl ethyl sulfide; CEES; 18mg at 1.5 mL/min) exposure. With carrier gas, L and/or C, significantly enhanced the measured WBCMA, while P sustained WBCMA, when compared to HWB without drug(s). This salutary, in vitro effect explained why L significantly improved or C, P, C+L, C+P or L+P sustained WBCMA with CEES, when compared to HWB without drug(s). However, when drug(s) was present in both the CEES and carrier gas conditions, the WBCMA was significantly reduced by CEES exposure.
DTIC
Blood; Drugs; Ethyl Compounds; Leukocytes; Metabolism; Sulfides

20060021877 American Registry of Pathology, Washington, DC USA
New Approaches for Early Detection of Breast Tumor Invasion or Progression
Man, Yan-Gao; Nov 2005; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0130
Report No.(s): AD-A448022; No Copyright; Avail.: CASI: A03, Hardcopy

To assess interactions between epithelial (EP) and myoepithelial (ME) cells in association with breast tumor progression and invasion, a double immunostaining technique with antibodies to smooth muscle actin (SMA) and estrogen receptor (ER) was used to elucidate the ME and EP cells in breast tissues harboring ductal carcinoma in situ (DCIS). Single or clusters of EP cells with a marked diminution or a total loss of the ER expression were found immediately overlying focally disrupted ME cell layers. These tumor cells showed several unique features, including a significantly higher rate of proliferation, genetic instability, and expression of tumor invasion-related genes. This was in sharp contrast to the adjacent dominant population of ER (+) cells within the same duct that showed no associated ME cell layer disruptions. This study attempted to confirm the authors' previous findings on a larger number of cases, and to compare the immunohistochemical and molecular biological profiles of the ER (-) cells overlying disrupted ME cell layers with those of adjacent ER (+) cells and surrounding stromal (ST) cells. Since ME cell layers are physical barriers protecting the microenvironment and integrity of EP cells, and the disruption of ME cell layers is an absolute pre-requisite for breast tumor invasion, the outcomes of this project could have significant value in early detection of breast tumor invasion and/or progression. The authors suggest that focal ME layer disruptions might represent an early sign of tumor invasion, and that cells overlying focal ME layer disruptions might represent precursors of invasive lesions. They have further proposed that breast tumor invasion is triggered by a localized degeneration of injured or aged ME cells and resultant immunoreactions, which stimulate tumor stem cells to proliferate and invade.
DTIC
Breast; Cancer; Detection; Disrupting; Epithelium; Estrogens; Genetics; Mammary Glands; Tumors

20060021884 Mount Sinai School of Medicine, New York, NY USA
Restoration of Wild-Type Activity to Mutant p53 in Prostate Cancer: A Novel Therapeutic Approach
Manfredi, James; Jan 2006; 8 pp.; In English
Contract(s)/Grant(s): W81XWH-05-1-0109
Report No.(s): AD-A448036; No Copyright; Avail.: CASI: A02, Hardcopy

A summary is presented of research performed during the first year of a project to determine feasibility of approaches to restore wild-type transcriptional activity on mutant p53 proteins found in human prostate tumors. p53 mutant proteins that are specifically relevant to prostate cancer are being examined to determine whether they are suitable targets for such an approach. Three specific aims are being pursued. The first is characterizing the interaction of p53 with two distinct classes of its response elements. The second aim is determining the role of mutant p53 proteins in prostate cancer cell proliferation. The final aim is to explore approaches to restore wild-type function to mutant p53 proteins found in prostate cancer. The long term goals of this research is to identify small molecular weight compounds which have the novel activity of restoring wild-type function to prostate cancer derived mutant p53 proteins. As such, this represents a preclinical development of highly targeted therapy with the hope of establishing highly effective and tumor-specific treatments of human prostate cancer.
DTIC
Cancer; Genes; Prostate Gland; Proteins; Restoration; Therapy

20060021893 Cincinnati Univ., OH USA

The Role of RB in the Therapeutic Response of Breast Cancer

Bosco, Emily E; Mar 1, 2006; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0329

Report No.(s): AD-A448074; No Copyright; Avail.: CASI: A03, Hardcopy

The retinoblastoma tumor suppressor protein (RB) is functionally inactivated in the majority of human cancers and nearly half of all breast cancers. RB participates in the growth regulation of breast cancer cells by controlling G1-S phase progression and mediating cell cycle arrest in response to DNA damage and anti-mitogenic signaling. Initially, estrogen-dependent breast tumors are often treated with anti-estrogens, such as tamoxifen or ICI, 182,780, while tumors that have become resistant are often treated with DNA-damaging agents such as ionizing radiation (IR) or cisplatin (CDDP). Although RB loss has been implicated in the bypass of both DNA damaging and anti-estrogenic therapeutic pathways exploration of the function of RB in breast cancer therapy has been limited. Here we develop stable clones to recapitulate RB loss in the MCF7 breast cancer model system using siRNA. In this model we demonstrate that acute RB loss in breast cancer cells results in downstream target deregulation. Additionally our data reveals that RB loss results in a growth advantage in vitro which is recapitulated in vivo as evidenced by accelerated tumor development in nude mouse xenografts. Interestingly RB-deficiency in these cells contributes to resistance to hormone ablation therapy in vitro and in vivo. RB knockdown cells are also resistant to DNA damage therapy ultimately leading to increased sensitivity both in vitro and in vivo. Taken together our data indicate that RB loss in breast cancer facilitates accelerated growth and cellular resistance to two major modes of breast cancer.

DTIC

Breast; Cancer; Mammary Glands; Proteins; Therapy

20060021896 Children's Hospital Medical Center, Boston, MA USA

Prevention of the Angiogenic Switch in Human Breast Cancer

Folkman, Judah; Mar 2006; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0316

Report No.(s): AD-A448079; No Copyright; Avail.: CASI: A03, Hardcopy

The overall goal of this project is to determine if human breast cancer can be prevented from becoming angiogenic when it is still at a microscopic size (i.e., \h 1 cubic millimeter). During the past year, from February 2005 to February 2006, the authors cloned three different human breast cancers that undergo the angiogenic switch at predictable times. They found that the angiogenic switch time is modified by host stroma; it is two-fold earlier for tumors in the mammary fat pad compared to tumors implanted in subcutaneous tissue. They also found that the angiogenic switch is preceded by repression of stromal expression of thrombospondin-1. Angiogenic tumor cells continue to secrete a novel thrombospondin-1 repressing factor. This protein has been purified and partially sequenced. For one of the breast cancers, the angiogenic switch can be detected when the tumor is microscopic in size by a significant increase in bFGF in platelet alpha granules. They also determined that the BRCA1 gene (breast cancer susceptibility gene), appears to regulate a ratio of thrombospondin-1 to VEGF in breast cancer cells. The lower the thrombospondin-1/VEGF ratio, the sooner the tumor cells will spontaneously switch to the angiogenic phenotype and grow large tumors in SCID mice. The article, 'A Model of Human Tumor Dormancy: An Angiogenic Switch from the Nonangiogenic Phenotype,' by George N. Naumov, et al. is appended.

DTIC

Angiogenesis; Breast; Cancer; Genes; Inhibitors; Mammary Glands; Prevention; Regulators; Switches; Switching

20060021898 Texas Univ. Health Science Center, San Antonio, TX USA

Investigation of the Akt/PKB Kinase in the Development of Hormone-Independent Prostate Cancer

DeGraffenried, Linda A; Feb 2006; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0218

Report No.(s): AD-A448082; No Copyright; Avail.: CASI: A02, Hardcopy

Our laboratory has been interested in the role of Akt in the development of hormone independent cancers. Using a breast cancer cell model, we previously demonstrated that tumors with a constitutively active Akt are resistant to anti-hormone therapy. In this study we have expanded upon our preliminary observations in the breast model into in vitro prostate cancer models to determine the molecular and biological mechanisms underlying these findings. In our second year of this study, we found that treatment with an Akt inhibitor prevented the progression of LNCaP cells to a state of androgen-independence. These results correlated with suppression of expression of the androgen receptor, as well as suppression of the pro-survival proteins bcl-2 and NF-kB. We are currently exploring the significance of these findings in relationship to the preventive properties of the omega-3 fatty acids. Currently, progression of prostate cancer to androgen independence remains the primary

obstacle to improved survival with this disease. The results of our studies suggest that targeting the Akt pathway may provide a strategy for preventing progression, resulting in increased survival among patients with recurrent disease.
DTIC
Cancer; Hormones; Prostate Gland

20060021899 Hadassah Medical Organization, Jerusalem, Israel
Involvement and Regulation of Heparanase in Prostate Cancer Progression
Elkin, Michael; Feb 2006; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0235
Report No.(s): AD-A448084; No Copyright; Avail.: CASI: A03, Hardcopy

Enhanced heparanase expression correlates with metastatic potential, tumor vascularity and reduced postoperative survival of cancer patients. These observations, the anti-cancerous effect of heparanase gene silencing (ribozyme, siRNA) and of heparanase-inhibiting oligosaccharides, peptides and antibodies, as well as the unexpected identification of a single functional heparanase, suggest that the enzyme is a promising target for anti-cancer drug development. Our studies focused on the regulation of heparanase gene expression (i.e., promoter methylation, action of sex steroids, p53) and effect of augmented levels the enzyme on malignant behavior of prostate cancer cells. We designed effective inhibitory strategies, based on recently created chemical and molecular tools (chemically modified heparin species, siRNA-expressing vector), as well as on better understanding of biochemical aspects of heparanase proenzyme activations (inhibitory peptide approach), toward future development of effective anti-cancer therapeutic modalities.
DTIC
Cancer; Heparins; Metastasis; Prostate Gland

20060021903 Logistics Management Inst., McLean, VA USA
Medical Materiel Readiness Metrics
Cocrane, Richard; Jun 23, 2005; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A448098; No Copyright; Avail.: CASI: A03, Hardcopy

Meeting the Class VIII requirement: Addressing COCOM Surgeons' confidence: * 2000 - Joint Warfighting Capabilities Assessment - 'Most items needed to support the Department of Defense's (DoD) wartime needs could be obtained in sufficient quantities from the department's established suppliers, or Prime Vendors (PV).' * 2002 - Combat Support Agency Review Team - 'Exclusive reliance upon medical prime vendor suppliers increases the risks of not meeting surge requirements for a large-scale contingency.' Premise: Executive Agent is required to improve supply chain responsiveness to contingency and wartime operations.
DTIC
Combat; Maintainability; Medical Equipment; Supplying

20060021904 California Univ., San Francisco, CA USA
CTLA-4 Blockade-Based Immunotherapy in Prostate Cancer
Rini, Brian I; Jan 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0127
Report No.(s): AD-A448099; No Copyright; Avail.: CASI: A02, Hardcopy

CTLA-4 is an inhibitory molecule on T cells that induces T cell downregulation. Granulocyte-macrophage colony-stimulating factor (GM-CSF) is a growth and survival factor for dendritic cells. The safety of combining GM-CSF with CTLA-4blockade in prostate cancer patients is being investigated in an ongoing phase I trial. Methods: Sequential cohorts of 3-6 patients receive GM-CSF 250mug/m2/d subcutaneously on days 1-14 of a 28-day cycle withescalating doses of anti-CTLA antibody on day 1 of each cycle x 4. Patients are monitored for clinical autoimmunity with T celiphenotyping performed. Results: Twenty patients have been treated to date. Dose-limiting toxicity (DLT) was not observed in the initial CTLA-4 antibody doselevel. Two DLTs consisting of a vertebrobasilar TIA possibly related to therapy and a generalized rash requiring steroids wereobserved in the second and third dose levels respectively resulting in expansion of each to 6 patients. No laboratory evidence ofautoimmunity has been observed in any patient. Expansion of monocytes 1 dendritic cells and upregulation of PBMC activation markershave been seen consistent with known GM-CSF effect. A dose response relationship has been seen between anti-CTLA-4 dose andactivation of both 004+ and 008+ T cells in the blood. These effects were increased compared to effects seen with anti-CTLA4treatment alone on a separate trial. T cell interferon-gamma production and lytic activity were also enhanced in circulating antigen-specific CD8+ T cells after this combination immunotherapy.

Conclusions: CTLA-4 blockade and GM-CSF has demonstrated preliminary safety in advanced prostate cancer. Accrual andimmunologic analyses are ongoing. A phase II trial is being planned of this combination in vaccination-failure prostate cancer patients.
DTIC
Antibodies; Cancer; Prostate Gland

20060021905 Massachusetts General Hospital, Boston, MA USA
An Analysis of Rho-PKN Signaling in Prostate Cancer Using Drosophila Genetics
Betson, Martha E; Jan 2006; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0141
Report No.(s): AD-A448101; No Copyright; Avail.: CASI: A03, Hardcopy

The Rho effector protein kinase N (PKN) has been implicated in prostate cancer. To study the role of PKN andclosely related PRK2 in prostate cancer progression, lentiviral small hairpin RNA constructs have been obtained andwhich knock down expression of PKN and PRK2 in human cells. The constructs will be introduced into prostatecancer cells to study the role of PKN and PRK2 in cellular processes related to tumorigenesis. To identify novelcomponents of the PKN signaling pathway, a genetic screen has been undertaken in the fruit fly Drosophilamelanogaster, which has a well-conserved Pkn gene. So far two potential genetic interactors for Pkn have beenidentified: CKlla-i3 and RHOGAP71E. Screening is still ongoing so more interactors may be discovered. For anyinteractors identified, the mechanism of interaction with Pkn and the conservation of the pathway in humans the willbe investigated. Taken together these studies should lead to an increased understanding of a poorly characterizedsignaling pathway in flies and humans which may play a role in prostate cancer progression.
DTIC
Cancer; Drosophila; Genetics; Prostate Gland

20060021906 Oak Ridge National Lab., TN USA
Combinatorial Genetic Regulatory Network Analysis Tools for High Throughput Transcriptomic Data
Chesler, Elissa J; Langston, Michael A; Jan 2006; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-01-1-0608; CCR-0311500
Report No.(s): AD-A448102; No Copyright; Avail.: CASI: A03, Hardcopy

Abstract: A series of genome-scale algorithms and high-performance implementations is described and shown to be useful in the genetic analysis of gene transcription. With them it is possible to address common questions such as: are the sets of genes coexpressed under one type of conditions the same as those sets co-expressed under another? A new noise-adaptive graph algorithm, dubbed paraclique, is introduced and analyzed for use in biological hypotheses testing. A notion of vertex coverage is also devised, based on vertex-disjoint paths within correlation graphs, and used to determine the identity, proportion and number of transcripts connected to individual phenotypes and quantitative trait loci (QTL) regulatory models. A major goal is to identify which, among a set of candidate genes, are the most likely regulators of trait variation. These methods are applied in an effort to identify multiple-QTL regulatory models for large groups of genetically co-expressed genes, and to extrapolate the consequences of this genetic variation on phenotypes observed across levels of biological scale through the evaluation of vertex coverage. This approach is furthermore applied to definitions of homology-based gene sets, and the incorporation of categorical data such as known gene pathways. In all these tasks discrete mathematics and combinatorial algorithms form organizing principles upon which methods and implementations are based. Keywords: Microarray Analysis, Putative Co-Regulation, Quantitative Trait Loci, Regulatory Models
DTIC
Algorithms; Combinatorial Analysis; Genes; Genetics; Network Analysis

20060021907 Boston VA Research Inst., Inc., MA USA
AUTOLOGOUS Marrow-Derived Stem Cell-Seeded Gene-Supplemented Collagen Scaffolds for Spinal Cord Regeneration as a Treatment for Paralysis
Spector, Myron; Jan 2006; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0129
Report No.(s): AD-A448103; No Copyright; Avail.: CASI: A03, Hardcopy

The long-term objective of this research is to develop a device for treating spinal cord injury. The specific aims of the proposed study are to test new types of collagen tubes and porous collagen scaffolds. Moreover, the authors will be

investigating the effects of incorporating genes from nerve growth factors into the collagen scaffolds and seeding the scaffolds with marrow-derived mesenchymal stem cells. The standardized defect site is a 5-mm gap in the rat thoracic spinal cord. Their principal method of evaluation is histomorphometry. During the past project year, the authors made progress in determining the effects of selected design variables on the reparative processes in spinal cord defects: (1) development of methods to fabricate collagen tubes and porous cylindrical scaffolds, (2) implantation of collagen tube devices into the rat spinal cord, (3) development of a method for the quantitative analysis of images of axons in the reparative tissue, and (4) implementation of methods for the isolation and growth of marrow-derived mesenchymal stem cells.
DTIC
Bone Marrow; Collagens; Injuries; Paralysis; Spinal Cord; Stem Cells; Therapy

20060021910 Thomas Jefferson Univ., Philadelphia, PA USA
Quantification of the Benefits of Pendent Mammography
Piccoli, Catherine W; Oct 2005; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0650
Report No.(s): AD-A448115; No Copyright; Avail.: CASI: A02, Hardcopy

The purpose of this study was to test the benefits of pendent mammography by imaging women and acquiring both conventional (erect) and pendent mammograms. We performed quantitative analysis of the mammograms, to determine the effect of leaning on the amount of breast tissue imaged, the compression obtained, and the dose to the breast. Additionally, we assessed the preferences of radiologists for pendent images as compared to erect positioned images. Our hypothesis was that pendent mammography provided superior images since gravity from leaning forward aids in pulling the breast away from the body, thereby increasing the amount of retroglandular breast tissue evident on a mammogram. Overall, we found that erect mammography was superior to pendent mammography, imaging more total breast tissue area and delivering a smaller radiation dose. Additionally, radiologists preferences for the images, based on ACR criteria for clinical technical quality, were similar although they preferred the positioning with the erect mammography. While the findings from this study reject our initial hypotheses, it brings to light the problems with positioning the breast with pendent mammography.
DTIC
Breast; Cancer; Mammary Glands

20060022169 NASA Ames Research Center, Moffett Field, CA, USA
Water as a matrix for life
Pohorille, Andrew; Pratt, Lawrence; [2006]; 1 pp.; In English; AbSciCon 2006, 26 Mar. 2006, Washington, DC, USA; No Copyright; Avail.: Other Sources; Abstract Only

'Follow the water' is the canonical strategy in searching for life in the universe. Conventionally, discussion of this topic is focused on how solvent supports organic chemistry sufficiently rich to seed life. Perhaps more importantly, solvent must promote self-organization of organic matter into functional structures capable of responding to environmental changes. This process is based on non-covalent interactions. They are constantly formed and broken in response to internal and external stimuli. This requires that their strength must be properly tuned. If they were too weak, the system would exhibit undesired, uncontrolled response to natural fluctuations of physical and chemical parameters. If they were too strong kinetics of biological processes would be slow and energetics costly. Non-covalent interactions are strongly mediated by the solvent. Specifically, high dielectric solvents for life are needed for solubility of polar species and flexibility of biological structures stabilized by electrostatic interactions. Water exhibits a remarkable trait that it promotes solvophobic interactions between non-polar species, which are responsible for self-organization phenomena such as the formation of cellular boundary structures, and protein folding and aggregation. Unusual temperature dependence of hydrophobic interactions - they often become stronger as temperature increases - is a consequence of the temperature insensitivity of properties of the liquid water. This contributes to the existence of robust life over a wide temperature range. Water is not the only liquid with favorable properties for supporting life. Other pure liquids or their mixtures that have high dielectric constants and simultaneously support some level of self-organization will be discussed.
Author
Activity (Biology); Water; Organic Materials; Hydrophobicity; Liquids; Dielectrics; Solubility

20060022562 NASA Ames Research Center, Moffett Field, CA, USA
Mathematical Modeling of the Origins of Life
Pohorille, Andrew; January 2006; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The emergence of early metabolism - a network of catalyzed chemical reactions that supported self-maintenance, growth, reproduction and evolution of the ancestors of contemporary cells (protocells) was a critical, but still very poorly understood step on the path from inanimate to animate matter. Here, it is proposed and tested through mathematical modeling of biochemically plausible systems that the emergence of metabolism and its initial evolution towards higher complexity preceded the emergence of a genome. Even though the formation of protocellular metabolism was driven by non-genomic, highly stochastic processes the outcome was largely deterministic, strongly constrained by laws of chemistry. It is shown that such concepts as speciation and fitness to the environment, developed in the context of genomic evolution, also held in the absence of a genome.
Derived from text
Biological Evolution; Genome; Mathematical Models; Metabolism

52
AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments, see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

20060021438 Institute for Human Factors TNO, Soesterberg, Netherlands
Protecting Crew Members Against Military Vehicle Noise
van Wijngaarden, Sander J; James, Soo; Oct 2004; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A446747; No Copyright; Avail.: CASI: A03, Hardcopy
No abstract available
Crews; Flight Crews

20060021439 National Research Council of Canada, Ottawa, Ontario Canada
Measurement of Noise in Armoured Personnel Carriers
Zimcik, D G; Provencher, R M; Lecheminant, B; McNamara, D; Oct 2004; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A446765; No Copyright; Avail.: CASI: A03, Hardcopy
No abstract available
Measurement; Noise Measurement; Noise Reduction; Personnel

20060021440 Naval Surface Warfare Center, Panama City, FL USA
Shock Mitigation for the Human on High Speed Craft: Development of an Impact Injury Design Rule
Peterson, Ron; Pierce, Eric; Price, Brian; Bass, Cameron; Oct 2004; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A446789; No Copyright; Avail.: CASI: A03, Hardcopy
No abstract available
High Speed; Injuries; Military Personnel

20060021601 NASA Johnson Space Center, Houston, TX, USA
Functional brain imaging of a complex navigation task following one night of total sleep deprivation
Strangman, Gary; Thompson, John H.; Strauss, Monica M.; Marshburn, Thomas H.; Sutton, Jeffrey P.; [2006]; 2 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only
Study Objectives: To assess the cerebral effects associated with sleep deprivation in a simulation of a complex, real-world, high-risk task. Design and Interventions: A two-week, repeated measures, cross-over experimental protocol, with counterbalanced orders of normal sleep (NS) and total sleep deprivation (TSD). Setting: Each subject underwent functional magnetic resonance imaging (fMRI) while performing a dual-joystick, 3D sensorimotor navigation task (simulated orbital docking). Scanning was performed twice per subject, once following a night of normal sleep (NS), and once following a single night of total sleep deprivation (TSD). Five runs (eight 24s docking trials each) were performed during each scanning session. Participants: Six healthy, young, right-handed volunteers (2 women; mean age 20) participated. Measurements and Results: Behavioral performance on multiple measures was comparable in the two sleep conditions. Neuroimaging results within sleep conditions revealed similar locations of peak activity for NS and TSD, including left sensorimotor cortex, left precuneus (BA 7), and right visual areas (BA 18/19). However, cerebral activation following TSD was substantially larger and exhibited

higher amplitude modulations from baseline. When directly comparing NS and TSD, most regions exhibited TSD\gNS activity, including multiple prefrontal cortical areas (BA 8/9,44/45,47), lateral parieto-occipital areas (BA 19/39, 40), superior temporal cortex (BA 22), and bilateral thalamus and amygdala. Only left parietal cortex (BA 7) demonstrated NS\gTSD activity. Conclusions: The large network of cerebral differences between the two conditions, even with comparable behavioral performance, suggests the possibility of detecting TSD-induced stress via functional brain imaging techniques on complex tasks before stress-induced failures.
Author
Cerebrum; Sleep Deprivation; Sensorimotor Performance; Hemodynamic Responses; Amplitude Modulation

20060021607 Wyle Labs., Inc., Houston, TX, USA
Metronome to Coordinate the Breaths and Cardiac Compressions Delivered by Minimally-Trained Caregivers During Two-Person CPR
Hurst, Victor, IV; West, Sarah; Austin, Paul; Branson, Richard; Beck, George; [2005]; 1 pp.; In English; Aerospace Medicine Association Annual Conference, 8-12 May 2005, Kansas City, MO, USA; Copyright; Avail.: Other Sources; Abstract Only

Astronaut crew medical officers (CMO) aboard the International Space Station (ISS) receive 40 hours of medical training over 18 months before each mission, including two-person cardiopulmonary resuscitation (2CPR) as recommended by the American Heart Association (AHA). Recent studies have concluded that the use of metronomic tones improves the coordination of 2CPR by trained clinicians. 2CPR performance data for minimally-trained caregivers has been limited. The goal of this study was to determine whether use of a metronome by minimally-trained caregivers (CMO analogues) would improve 2CPR performance. 20 pairs of minimally-trained caregivers certified in 2CPR via AHA guidelines performed 2CPR for 4 minutes on an instrumented manikin using 3 interventions: 1) Standard 2CPR without a metronome [NONE], 2) Standard 2CPR plus a metronome for coordinating compression rate only [MET], 3) Standard 2CPR plus a metronome for coordinating both the compression rate and ventilation rate [BOTH]. Caregivers were evaluated for their ability to meet the AHA guideline of 32 breaths-240 compressions in 4 minutes. All (100%) caregivers using the BOTH intervention provided the required number of ventilation breaths as compared with the NONE caregivers (10%) and MET caregivers (0%). For compressions, 97.5% of the BOTH caregivers were not successful in meeting the AHA compression guideline; however, an average of 238 compressions of the desired 240 were completed. None of the caregivers were successful in meeting the compression guideline using the NONE and MET interventions. This study demonstrates that use of metronomic tones by minimally-trained caregivers for coordinating both compressions and breaths improves 2CPR performance. Meeting the breath guideline is important to minimize air entering the stomach, thus decreasing the likelihood of gastric aspiration. These results suggest that manifesting a metronome for the ISS may augment the performance of 2CPR on orbit and thus may increase the level of care.
Author
Cardiovascular System; Breathing; Resuscitation; Pulmonary Functions

20060022528 Naval Medical Research Center, Silver Spring, MD USA
Multi-Day Air Saturation at 20 and 22 FSW With Direct Ascent: Data Report on Project 92-09
Hamilton, R W; Thalmann, Edward D; Temple, Diana J; Mar 2002; 39 pp.; In English
Contract(s)/Grant(s): N0463A-00-M-0051; Proj-M0099
Report No.(s): AD-A447718; NMRC-02-01; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447718; Avail.: CASI: A03, Hardcopy

The purpose of this report is to provide access to experimental laboratory data involving human decompression exposures that have not been published and thus are not presently available for analysis by Navy and other researchers. As such this is only a report of the data, not a write-up of the experiment. This project was designed to evaluate experimentally the maximum depth from which a diver could ascend directly to the surface from saturation with air without getting decompression sickness.
DTIC
Decompression Sickness; Pressure Reduction; Exposure

20060022556 NASA Johnson Space Center, Houston, TX, USA
Foot Forces during Treadmill Exercise on the International Space Station
Cavanagh, Peter R.; Rice, Andrea J.; Maender, Christian C.; Gopalakrishnan, Raghavan; Genc, Kerim O.; Kuklis, Matthew; [2006]; 1 pp.; In English; 2006 BMES Annual Fall Meeting, 11-14 Oct. 2006, Chicago, IL, USA; No Copyright; Avail.: Other Sources; Abstract Only

Exercise has been the primary countermeasure to combat musculoskeletal changes during the approximately 6 month missions to the International Space Station (ISS). However, these countermeasures have not been successful in preventing loss of bone mineral density in the spine and hip of astronauts. We examined lower extremity loading during typical bouts of on-orbit exercise performed by 4 ISS crew members on the ISS treadmill (TVIS) and during locomotor activities on earth (1g). In-shoe forces were monitored at 128Hz using force-measuring insoles placed inside the shoes of the exercising crewmember, stored temporarily on Flash cards, and down-linked via satellite for analysis. Custom software extracted peak forces from up to 30 minutes of locomotor activity. All on-orbit loading conditions for walking and running resulted in peak forces and impact loading rates that were significantly less than those measured in 1g. Typical single leg loads on-orbit in walking and running were 0.860 plus or minus 0.04 body weights (BW) and 1.339 plus or minus 0.07 BW compared to 1.2 plus or minus 0.036 BW and 2.36 plus or minus 0.07 BW in 1g BW respectively. These results indicate that typical exercise on the ISS treadmill does not generate 1g-like loading conditions. This may be partly responsible for the loss of bone mineral density that has been observed in these and other crew members. Since on-orbit treadmill exercise requires a restraining load to return the crew member to the treadmill surface, more studies are required to enable comfortable full body weight loading to be applied. Author

International Space Station; Physical Exercise; Treadmills; Feet (Anatomy); Loads (Forces)

20060022642 NASA Johnson Space Center, Houston, TX, USA

Airborne Dust in Space Vehicles and Habitats

James, John; January 2006; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

Airborne dust, suspended inside a space vehicle or in future celestial habitats, can present a serious threat to crew health if it is not controlled. During the Apollo missions to the moon, lunar dust brought inside the capsule caused eye irritation and breathing difficulty to the crew when they launched from the moon and re-acquired 'microgravity.' During Shuttle flights reactive and toxic dusts such as lithium hydroxide have created a risk to crew health, and fine particles from combustion events can be especially worrisome. Under nominal spaceflight conditions, airborne dusts and particles tend to be larger than on earth because of the absence of gravity settling. Aboard the ISS, dusts are effectively managed by HEPA filters, although floating dust in newly-arrived modules can be a nuisance. Future missions to the moon and to Mars will present additional challenges because of the possibility that external dust will enter the breathing atmosphere of the habitat and reach the crew's respiratory system. Testing with simulated lunar and Martian dust has shown that these materials are toxic when placed into the lungs of test animals. Defining and evaluating the physical and chemical properties of Martian dusts through robotic missions will challenge our ability to prepare better dust simulants and to determine the risk to crew health from exposure to such dusts. Author

Dust; Spacecraft Cabin Atmospheres; Particles; Spacecraft Environments; Space Habitats; Lunar Dust; Mars Surface; Habitats; Aerospace Medicine

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering, bionics, man-machine systems, life support, space suits and protective clothing. For related information see also *16 Space Transportation and Safety* and *52 Aerospace Medicine*.

20060021441 Noesis, Inc., Manassas, VA USA

Human Performance Factors and Measures in Hull Form Selection

Pattison, John H; Sheridan, Daniel J; Oct 2004; 25 pp.; In English; Original contains color illustrations

Report No.(s): AD-A446795; No Copyright; Avail.: CASI: A03, Hardcopy

No abstract available

Hulls (Structures); Human Factors Engineering; Human Performance; Ships

20060021616 Foster-Miller Associates, Inc., Waltham, MA, USA

Human Factors Root Cause Analysis of Accidents/Incidents Involving Remote Control Locomotive Operations

Reinach, S.; Viale, A.; May 2006; 188 pp.; In English

Report No.(s): PB2006-111367; No Copyright; Avail.: National Technical Information Service (NTIS)

This report presents findings from a human factors root cause analysis (RCA) of six train accidents/incidents/collisions, derailments, and employee injuriesthat involved remote control locomotive (RCL) operations in U.S. railroad switching yards. Descriptive data from participating railroads were collected on all Federal Railroad Administration reportable RCL

accidents/incidents from May 1 to October 31, 2004. RCA were performed on six RCL accidents/incidents (case studies) to examine some of the factors that contributed to the events in further detail. RCA data collection and analysis tools were developed based on a modified version of the Human Factors Analysis and Classification System (HFACS-RR) to provide a theoretical foundation to the RCA. HFACS-RR identifies 23 unique categories of accident/incident contributing factors among five different levels of a system. Participating railroads reported a total of 67 RCL accidents/incidents: 29 collisions, 25 derailments, and 13 employee injuries. RCA were conducted on three collisions, two derailments, and one employee injury. A total of 36 probable contributing factors were identified among the 6 RCA, and 33 of these were concentrated among 6 HFACS-RR categories: technological environment (8), skill-based errors (7), the organizational process (6), inadequate supervision (5), decision errors (4), and resource management (3). Loss of remote control operator (RCO) situation awareness was a significant factor in five of the six accidents/incidents. Based on an analysis of all of the contributing factors, several key safety issues emerged: loss of RCO situation awareness, insufficient training, inadequate staffing and pairing of inexperienced crewmembers, and inadequate practices and procedures governing RCL operations and the use of RCL technology, including pullback protection. This report suggests recommendations for future research to enhance RCL operations safety.

NTIS

Accident Investigation; Human Factors Engineering; Locomotives; Rail Transportation; Remote Control; Safety; Transportation

20060021753 Army Research Inst. of Environmental Medicine, Natick, MA USA

Physiological Response to Cold Exposure in Men: A Disabled Submarine Study

Castellani, J W; O'Brien, C; Stulz, D A; Blanchard, L A; DeGroot, D W; Bovill, M E; Francis, T J; Young, A J; Jan 2002; 16 pp.; In English

Report No.(s): AD-A447871; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447871; Avail.: CASI: A03, Hard-copy

A disabled submarine (DISSUB) lacking power and/or environmental control will become cold, and the ambient air may become hypercapuic and hypoxic. This study examined if the combination of hypoxia, hypercapnia, and cold exposure would adversely affect thermoregulatory responses to acute cold exposure in survivors awaiting rescue. Seven male submariners (33 plus or minus 6 yrs) completed a series of cold-air tests (CAT) that consisted of 20-min at T(air) = 22 degree C, followed by a linear decline(1 degree C.min(- 1)) in T(air) to l2 degree C, which was then held constant for an additional 150-min. CAT were performed under normoxic, normocapnic conditions (D0), acute hypoxia (D1, 16.75% 02), after 4 days of chronic hypoxia, hypercapnia and cold (D5, l6.75% O2, 2.5% CO2, 4 degree C), and hypoxia-only again (D8, l6.75% O2). The change in T(sk) during CAT was larger (P\h0.05) on D0 (-5.2 degree C), vs D1 (-4.8 degree C), D5 (-4.5 degree C), and D8 (-4.4 degree C). The change (relative to 0-min) in metabolic heat production (change M) at 20-min of CAT was lower (P\h0.05) on D1, D5, and D8, vs. D0, with no differences between D1, D5 and D8. Change M was not different among trial at any time point after 20-min. The mean body temperature threshold for the onset of shivering was lower on D1 (35.O8 degree C), D5 (34.85 degree C). and D8 (34.69 degree C), compared to D0 (36.01 degree C). Changes in heat storage did not differ among trials and rectal temperature was not different in D0 vs. D1, D5, and D8. Thus, mild hypoxia (l6.75% F1CO2) impairs vascolostrictor and initial shivering responses, but the additimi of elevated F1CO2 and cold had no further effect. These thermoregulatory effector changes do not increase the risk for hypothermia in DISSUP survivors who are adequately clothed.

DTIC

Atmospheric Temperature; Disabilities; Exposure; Physiological Responses

20060021868 Army Research Lab., Fort Hood, TX USA

Training for Effective Human Supervisory Control of Air and Missile Defense Systems

Hawley, John K; Mares, Anna L; Giammanco, Cheryl A; Mar 2006; 42 pp.; In English

Report No.(s): AD-A447995; ARL-TR-3765; No Copyright; Avail.: CASI: A03, Hardcopy

One of the defining properties of the next generation of air and missile defense (AMD) command and control (C2) systems is an increasing reliance on automation. This report is the third in a series of three dealing with human performance and training issues in the development and effective use of automated AMD C2 systems. The first report (Hawley, Mares, & Giammanco, 2005) discusses the impact of automation on air defense operators and the consequences of their role change from traditional operators to supervisory controllers. The second report (Hawley & Mares, 2006) expands upon that background material and addresses the issue of developing effective human supervisory control (HSC) in AMD C2 systems. The focus of this report is training for AMD operators and the battle staff. In the words of the Army Board of Inquiry (BOI) investigating the Patriot fratricides that occurred during Operation Iraqi Freedom, it is necessary to re-look the level of

expertise required to operate such lethal systems on the modern battlefield. Together, these reports are intended as a primer on automation, supervisory control, and effective human performance for commanders, concept developers, system designers, trainers, and other personnel involved with decision-making and operations for the next generation of AMD C2 systems.
DTIC
Antimissile Defense; Command and Control; Education; Man Machine Systems; Manual Control; Missile Defense

20060021913 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
Toxicity of RDX, HMX, TNB, 2,4-DNT, and 2,6-DNT to the Earthworm, Eisenia Fetida, in a Sandy Loam Soil
Simini, Michael; Checkai, Ronald T; Kuperman, Roman G; Phillips, Carlton T; Kolakowski, Jan E; Kurnas, Carl W; Sunahara, Geoffrey; Mar 2006; 49 pp.; In English
Report No.(s): AD-A448121; ECBC-TR-467; No Copyright; Avail.: CASI: A03, Hardcopy

The U.S. Environmental Protection Agency is developing Ecological Soil Screening Levels (Eco-SSLs) for ecological risk assessment of soil contaminants at Superfund sites. Insufficient information existed to generate Eco-SSLs for explosives and related materials in soil. The earthworm (Eisenia fetida) reproduction test was conducted in Sassafras sandy loam soil amended with hexahydro-1,3 ,5-trinitro-1,3 5-triazine (RDX), octahydro-1 3,5,7-tetranitro-1,3 ,5,7-tetrazocine (HMX), 2,4-dinitrotoluene (2,4-DNT), 2,6-dinitrotoluene (2,6-DNT), and 1,3,5-trinitrobenzene (TNB) to fill the data gaps. Tests were conducted in freshly amended and in amended soils subjected to a weathering/aging process to better reflect exposure conditions in field soils. The order of toxicity in freshly amended soils, based on EC(sub 20) values for E. fetida juvenile production derived from non-linear regression analysis, was HMX \gRDX \g 2,6-DNT\g TNB \g 2,4-DNT. The order of toxicity of weathered/aged energetic materials in amended soils was RDX \g 2,6-DNT \g TNB \g 2,4-DNT\g HMX. Correlation of soil concentration with toxicity did not change when toxicity data were regressed with water extractable concentrations compared to acetonitrile extractable concentrations. Study results will be provided to the Eco-SSL workgroup for review and inclusion in the Eco-SSL database, and for developing Eco-SSLs for RDX, HMX, 2,4-DNT, 2,6-DNT, and TNB.
DTIC
Decomposition; Explosives; HMX; RDX; Soils; Toxicity

20060022016 National Technology Transfer Center, Wheeling, VA, USA
Spinoff 2005
2005; In English; See also 20060022017 - 20060022063; Original contains color illustrations
Report No.(s): NASA/NP-2005-12-419-HQ; No Copyright; Avail.: National Technology Transfer Center (NTTC), Wheeling, WV

Topics covered include: Lighting the Way for Quicker, Safer Healing; Discovering New Drugs on the Cellular Level; Hydrogen Sensors Boost Hybrids; Today s Models Losing Gas?; 3-D Highway in the Sky; Popping a Hole in High-Speed Pursuits; Monitoring Wake Vortices for More Efficient Airports; From Rockets to Racecars; All-Terrain Intelligent Robot Braves Battlefront to Save Lives; Keeping the Air Clean and Safe--An Anthrax Smoke Detector; Lightning Often Strikes Twice; Technology That's Ready and Able to Inspect Those Cables; Secure Networks for First Responders and Special Forces; Space Suit Spins; Cooking Dinner at Home--From the Office; Nanoscale Materials Make for Large-Scale Applications; NASA s Growing Commitment: The Space Garden; Bringing Thunder and Lightning Indoors; Forty-Year-Old Foam Springs Back With New Benefits; Experiments With Small Animals Rarely Go This Well; NASA, the Fisherman's Friend; Crystal-Clear Communication a Sweet-Sounding Success; Inertial Motion-Tracking Technology for Virtual 3-D; Then Why Do They Call Earth the Blue Planet?; Valiant 'Zero-Valent' Effort Restores Contaminated Grounds; Harnessing the Power of the Sun; Water and Air Measures That Make 'PureSense'; Remote Sensing for Farmers and Flood Watching; Pesticide-Free Device a Fatal Attraction for Mosquitoes Making the Most of Waste Energy Washing Away the Worries About Germs Celestial Software Scratches More Than the Surface A Search Engine That's Aware of Your Needs Fault-Detection Tool Has Companies 'Mining' Own Business; Software to Manage the Unmanageable; Tracking Electromagnetic Energy With SQUIDs; Taking the Risk Out of Risk Assessment; Satellite and Ground System Solutions at Your Fingertips; Structural Analysis Made 'NESSUSary'; Software of Seismic Proportions Promotes Enjoyable Learning; Making a Reliable Actuator Faster and More Affordable; Cost-Cutting Powdered Lubricant NASA s Radio Frequency Bolt Monitor: A Lifetime of Spinoffs Going End to End to Deliver High-Speed Data; Advanced Joining Technology: Simple, Strong, and Secure; Big Results From a Smaller Gearbox; Low-Pressure Generator Makes Cleanrooms Cleaner; and The Space Laser Business Model.
Derived from text
Structural Analysis; Remote Sensing; Information Retrieval; Fault Detection; Spaceborne Lasers; Robots; Risk; Radio Frequencies; Actuators; Commerce

20060022017 Biolog, Inc., Hayward, CA, USA
Discovering New Drugs on the Cellular Level
Spinoff 2005; 2005, pp. 8-9; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

With the Vision for Space Exploration calling for a sustained human presence in space, astronauts will need to grow plants, while in orbit, for nourishment that they will not receive from only consuming dehydrated foods. As a potential source of food for long-duration missions, space-grown plants could also give astronauts an important psychological boost, as fresh vegetables could serve as a welcomed change from monotonous meals consisting of reconstituted foods in plastic bags. Even more, these plants could likely aid in the recycling of air and wastewater on spacecraft. With a helping hand from a company by the name of Biolog, Inc., NASA is studying the impacts of decreased gravity and spaceborne bacteria on the plants being grown for food in space. With a helping hand from NASA, this very same company is creating powerful new cell- and bacteria-analysis tools for use in discovering and developing new drugs on Earth.
Derived from text
Drugs; Space Exploration; Gravitation; Recycling

20060022018 InterSense, Inc., Burlington, MA, USA
Inertial Motion-Tracking Technology for Virtual 3-D
Spinoff 2005; 2005, pp. 59-61; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

In the 1990s, NASA pioneered virtual reality research. The concept was present long before, but, prior to this, the technology did not exist to make a viable virtual reality system. Scientists had theories and ideas they knew that the concept had potential, but the computers of the 1970s and 1980s were not fast enough, sensors were heavy and cumbersome, and people had difficulty blending fluidly with the machines. Scientists at Ames Research Center built upon the research of previous decades and put the necessary technology behind them, making the theories of virtual reality a reality. Virtual reality systems depend on complex motion-tracking sensors to convey information between the user and the computer to give the user the feeling that he is operating in the real world. These motion-tracking sensors measure and report an object s position and orientation as it changes. A simple example of motion tracking would be the cursor on a computer screen moving in correspondence to the shifting of the mouse. Tracking in 3-D, necessary to create virtual reality, however, is much more complex. To be successful, the perspective of the virtual image seen on the computer must be an accurate representation of what is seen in the real world. As the user s head or camera moves, turns, or tilts, the computer-generated environment must change accordingly with no noticeable lag, jitter, or distortion. Historically, the lack of smooth and rapid tracking of the user s motion has thwarted the widespread use of immersive 3-D computer graphics. NASA uses virtual reality technology for a variety of purposes, mostly training of astronauts. The actual missions are costly and dangerous, so any opportunity the crews have to practice their maneuvering in accurate situations before the mission is valuable and instructive. For that purpose, NASA has funded a great deal of virtual reality research, and benefited from the results.
Derived from text
Virtual Reality; Sensory Feedback; Computer Graphics; Astronaut Training; Maneuvers

20060022019 Item Software, Inc., Anaheim, CA, USA
Taking the Risk Out of Risk Assessment
Spinoff 2005; 2005, pp. 90-91; In English; See also 20060022016; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

The ability to understand risks and have the right strategies in place when risky events occur is essential in the workplace. More and more organizations are being confronted with concerns over how to measure their risks or what kind of risks they can take when certain events transpire that could have a negative impact. NASA is one organization that faces these challenges on a daily basis, as effective risk management is critical to the success of its missions especially the Space Shuttle missions. On July 29, 1996, former NASA Administrator Daniel Goldin charged NASA s Office of Safety and Mission Assurance with developing a probabilistic risk assessment (PRA) tool to support decisions on the funding of Space Shuttle upgrades. When issuing the directive, Goldin said, 'Since I came to NASA [in 1992], we've spent billions of dollars on Shuttle upgrades without knowing how much they improve safety. I want a tool to help base upgrade decisions on risk.' Work on the PRA tool began immediately. The resulting prototype, the Quantitative Risk Assessment System (QRAS) Version 1.0, was jointly developed by NASA s Marshall Space Flight Center, its Office of Safety and Mission Assurance, and researchers at the University of Maryland. QRAS software automatically expands the reliability logic models of systems to evaluate the probability of highly detrimental outcomes occurring in complex systems that are subject to potential accident scenarios. Even

in its earliest forms, QRAS was used to begin PRA modeling of the Space Shuttle. In parallel, the development of QRAS continued, with the goal of making it a world-class tool, one that was especially suited to NASA s unique needs. From the beginning, an important conceptual goal in the development of QRAS was for it to help bridge the gap between the professional risk analyst and the design engineer. In the past, only the professional risk analyst could perform, modify, use, and perhaps even adequately understand PRA. NASA wanted to change this by developing a PRA tool that would be friendlier, more understandable, and more useful to the broader engineering community. This concept ultimately led to the look, feel, and functionality that QRAS has today.
Derived from text
Reliability Analysis; Assessments; Risk; Probability Theory; Complex Systems; Software Reliability

20060022020 Scratch and Newton Ltd., Unknown
Experiments With Small Animals Rarely Go This Well
Spinoff 2005; 2005, pp. 50-51; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

In the mid-1950s, a young U.S. Air Force engineer named Clark Beck began work with what is now one of NASA s most prolific spinoffs, the radiant barrier technology. Beck s work involved creating materials that could withstand the immense heat created by passage through the Earth s atmosphere. He was working on structures and resources that could withstand the fluctuations in temperature created by a skip reentry, where a craft would skip along the surface of the atmosphere, gradually making inroads sufficient for reentry, a process that took the craft from extreme heat to frigid cold every few seconds. The material also needed to withstand millions of pounds of pressure per inch of bending without twisting, the simulated force of reentry. Without reflective material, the craft would get what Beck refers to as ‘red hot wings,’ and without the required flexibility, the craft would break apart. One result of Beck s work was the discovery of the useful properties of radiant barrier material. The Space Agency used Beck s design work for the materials that went into building the space capsules, heat resistant instrument panels, and, in conjunction with the Air Force, an early spacecraft prototype, the DynaSoar, that looks remarkably similar to the present-day Space Shuttle. NASA used the thin, shiny, silver material to protect the first space explorers from the harsh environment of space, which could range from -460 F to 541 F. If the engineers had used conventional insulation for the space suits, the fabric would have been 7-feet thick, a little awkward for even the most nimble of astronauts to maneuver. Radiant barrier technology was clearly the solution. It reflected the astronaut s body heat back into the suit to keep him warm, while at the same time reflecting radiant energy from the Sun outward to keep him cool. The radiant barrier material reflected more than 95 percent of the radiant energy away from the wearer, while tiny holes in the fabric allowed moisture to escape and longer heat waves to get through. This amazing fabric had an added benefit that made it ideal for its space-bound application: It weighed only 17 pounds per 1,000 square feet. NASA has used this material ever since the Gemini and Apollo missions, on virtually all of its spacecraft, and even on unmanned missions as thermal protection for instruments.
Derived from text
Radiant Flux Density; Thermal Protection; Thermal Resistance; Insulation

20060022021 FACE International Corp., Norfolk, VA, USA
Bringing Thunder and Lightning Indoors
Spinoff 2005; 2005, pp. 42-45; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Piezoelectric materials convert mechanical energy into electrical energy and electrical energy into mechanical energy. They generate electrical charges in response to mechanical stress and generate mechanical displacement and/or force when subjected to an electric current. Scientists at Langley Research Center have developed a piezoelectric device that is superior in many ways to those that used to be the only ones commercially available. It is tougher, has far greater displacement and greater mechanical load capacity for a comparative voltage operation, can be easily produced at a relatively low cost, and lends itself well to mass production. The NASA-developed piezoelectric device is also unique in that it is more efficient in extracting electrical energy from the mechanical energy that goes in. It works on a simple principle. A thin ceramic piezoelectric wafer is sandwiched between an aluminum sheet and a steel sheet and held together with LaRC-SI, an amorphous thermoplastic adhesive with special properties created by NASA at Langley. The sandwich is heated in an autoclave, and the adhesive melts. When the sandwich cools, the adhesive bonds the parts together into one piezoelectric element. While they cool, the components of the element contract at different rates, since they are made of different materials. This differential shrinkage causes the element to warp in either a convex or concave shape, depending on which way it is oriented. The shrinking of the outside metal layers places the inside piezoelectric ceramic under mechanical stress. If the element is cantilevered by clamping one side and then plucked, it reverberates like a diving board that has just ejected a diver. This way, a small amount of

mechanical energy can result in a relatively long period of electrical generation. When the piezoelectric element is used for the creation of electricity, it is called Lightning. This same sandwiched piezoelectric wafer can also convert electrical energy into mechanical energy. Then, it is called Thunder. Electricity goes in, excites the element, and then, mechanical energy in the form of movement is generated.
Derived from text
Piezoelectric Ceramics; Electric Potential; Thermoplasticity; Lightning; Electricity; Displacement; Adhesive Bonding

20060022022 Zyvex Corp., Richardson, TX, USA
Nanoscale Materials Make for Large-Scale Applications
Spinoff 2005; 2005, pp. 38-39; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Since its dawning days, NASA has been at the forefront of developing and improving materials for aerospace applications. In particular, NASA requires dramatic advancements in material properties to enhance the performance, robustness, and reliability of its launch vehicles, spacecraft, and the International Space Station. Such advancements over the years include noise-abatement materials, fire-resistant fibers, heat-absorbing insulation, and light-but-strong moldable composites. In 1991, a new carbon fiber called a carbon nanotube was discovered and fully substantiated by a Japanese electron microscopist. Its dramatic strength and low density (20 times the tensile strength and one-sixth the density of steel) were turning the heads of materials scientists and engineers all around the world, including those who developed equipment for NASA. While NASA did not invent the carbon nanotube, it is working to advance the fibrous material for widespread, low-cost application in sending humans beyond low-Earth orbit, well into the outer reaches of the universe. Carbon nanotubes have the potential to reduce spacecraft weight by 50 percent or more, by replacing the heavier copper wires currently used, according to NASA scientists. Furthermore, NASA researchers have reported a new method for producing integrated circuits using carbon nanotubes instead of copper for interconnects. This technology has the capability to extend the life of the silicon chip industry by 10 years. Because of this growing interest in carbon nanotubes and their perpetual possibilities, NASA has funded both internal and external research in this field.
Author
Carbon Nanotubes; Carbon Fibers; Aerospace Engineering; Insulation; Reliability

20060022023 SunPower, Inc., Sunnyvale, CA, USA
Harnessing the Power of the Sun
Spinoff 2005; 2005, pp. 66-67; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

The Environmental Research Aircraft and Sensor Technology (ERAST) Alliance was created in 1994 and operated for 9 years as a NASA-sponsored coalition of 28 members from small companies, government, universities, and nonprofit organizations. ERAST s goal was to foster development of remotely piloted aircraft technology for scientific, humanitarian, and commercial purposes. Some of the aircraft in the ERAST Alliance were intended to fly unmanned at high altitudes for days at a time, and flying for such durations required alternative sources of power that did not add weight. The most successful solution for this type of sustained flight is the lightest solar energy. Photovoltaic cells convert sunlight directly into electricity. They are made of semi-conducting materials similar to those used in computer chips. When sunlight is absorbed, electrons are knocked loose from their atoms, allowing electricity to flow. Under the ERAST Alliance, two solar-powered technology demonstration aircraft, Pathfinder and Helios, were developed. Pathfinder is a lightweight, remotely piloted flying wing aircraft that demonstrated the technology of applying solar cells for long-duration, high-altitude flight. Solar arrays covering most of the upper wing surface provide power for the aircraft s electric motors, avionics, communications, and other electronic systems. Pathfinder also has a backup battery system that can provide power for between 2 and 5 hours to allow limited-duration flight after dark. It was designed, built, and operated by AeroVironment, Inc., of Monrovia, California. On September 11, 1995, Pathfinder reached an altitude of 50,500 feet, setting a new altitude record for solar-powered aircraft. The National Aeronautic Association presented the NASA-industry team with an award for 1 of the 10 Most Memorable Record Flights of 1995.
Derived from text
Solar Arrays; Solar Energy; Solar Powered Aircraft; Sunlight; Photovoltaic Cells; Solar Cells

20060022024 Chelton Flight Systems, Boise, ID, USA, Federal Aviation Administration, AK, USA
3-D Highway in the Sky
Spinoff 2005; 2005, pp. 12-13; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

If it were 50 years ago, NASA's contribution to rock and roll could have been more than just the all-astronaut rock band, Max Q, composed of six NASA astronauts, all of whom have flown aboard the Space Shuttle. If it were 50 years ago, a new NASA spinoff technology, Synthetic Vision, would likely have been able to prevent the fateful, small plane crash that killed rock and roll legends Buddy Holly, Ritchie Valens, and The Big Bopper on that stormy night in 1959. Synthetic Vision is a new cockpit display system that helps pilots fly through bad weather, and it has incredible life-saving potential. In 1997, the White House Commission on Aviation Safety and Security created NASA s Aviation Safety and Security Program (AvSSP) with the aim of sounding the depths of NASA s cutting-edge aviation advances and history of successes. The AvSSP decided to use NASA technology to cut the rate of fatal aviation accidents that occur because of lowered visibility and spatial disorientation, common problems that arise in poor weather conditions, in the dark, or with inexperienced pilots.
Derived from text
Aircraft Safety; Enhanced Vision; Display Devices; Visibility; Aircraft Accidents; Crashes; Cockpits

20060022025 Dynamic Systems, Inc., Leicester, NC, USA
Forty-Year-Old Foam Springs Back With New Benefits
Spinoff 2005; 2005, pp. 46-49; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

The most recognized and widely used NASA spinoff is at it again. Temper foam, whose origins date back to 1966 when it was developed to absorb shock and, thus, offer improved protection and comfort in NASA s airplane seats, has paid its dividends to Earth repeatedly, and in many different ways. It has padded the helmets of the Dallas Cowboys throughout the 1970s and 1980s, protected bedridden patients from bedsores, and comforted the feet of thousands wearing stylish shoes that incorporate the cushioning material in their insoles. Four decades later, the world has come to realize that there are no bounds to temper foam s benefits. Though the rights to the technology have been shared amongst various manufacturers, the original product maker is still going strong, pushing temper foam into new arenas, including automotives, amusement parks, prosthetics, and modern art.
Derived from text
Foams; Cushions; Prosthetic Devices; Protection

20060022026 Digital Media, Inc., Unknown
NASA, the Fisherman's Friend
Spinoff 2005; 2005, pp. 52-53; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Every angler has his secrets, whether it be an old family recipe for stink bait, a midnight worm-hunting ritual, or the most coveted of all, the no-fail fishing hole. Most of these secrets are lore and legend, passed through generations, and coveted more than the family s best tableware. Each of these kernels of wisdom promises the fisherman a bite at the end of the line, but very few are rooted in fact and science. There is one, though.... NASA partnered with a company on the bayous of Mississippi and Louisiana to use satellite data to create a marine information system, a space-age fish finder. This product provides up-to-date information about the location of a variety of fish, including yellowfin tuna, bluefish, blue marlin, white marlin, sailfish, blackfin tuna, little tunny, and swordfish. The system shows peaked catch rates, and may be the only true fish-finding product on the market.
Derived from text
Fishing; Information Systems; Position (Location); Fishes

20060022027 Arctic Products, Jefferson City, MO, USA
Pesticide-Free Device a Fatal Attraction for Mosquitoes
Spinoff 2005; 2005, pp. 74-75; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Are those pesky mosquitoes getting more entertainment out of your family picnic than you are? If the answer is yes, then it is time to reclaim your backyard with assistance from an unlikely partner. Nowadays, NASA is developing tools to track and predict the spread of the West Nile Virus on a global scale, but several years ago, the Space Agency carved out some time

to collaborate with an outdoor products manufacturer in order to help control mosquito populations on a local level. The technology resulting from this union leveraged a space-age heat blanket to attract mosquitoes, which would then be eliminated without the use of harmful pesticides or chemicals. technical assistance from NASA and is an environmentally safe way to reduce the mosquito population.
Derived from text
Pesticides; Insects; Warning Systems; Heat Sources; Electric Fields; Detection

20060022028 United Technologies Corp., USA, Creare, Inc., Hanover, NH, USA, NASA Glenn Research Center, Cleveland, OH, USA
Making the Most of Waste Energy
Spinoff 2005; 2005, pp. 76-77; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

The Thermo-Mechanical Systems Branch at NASA s Glenn Research Center is responsible for planning and conducting research efforts to advance thermal systems for space, aerospace, and non-aerospace applications. Technological areas pertain to solar and thermal energy conversion. For example, thermo-mechanical systems researchers work with gas (Stirling) and liquid/vapor (Rankine) systems that convert thermal energy to electrical power, as well as solar dynamic power systems that concentrate sunlight to electrical power. The branch s development of new solar and thermal energy technologies is propelling NASA s missions deep into unfamiliar territories of space. Solar dynamic power systems are actively improving the health of orbiting satellites, giving them longer life and a stronger radiation tolerance, thus, creating less need for on-orbit maintenance. For future missions, NASA may probe even deeper into the mysterious cosmos, with the adoption of highly efficient thermal energy converters that have the potential to serve as the source of onboard electrical power for satellites and spacecraft. Research indicates that these thermal converters can deliver up to 5 times as much power as radioisotope thermoelectric generators in use today, for the same amount of radioisotope. On Earth, energy-converting technologies associated with NASA s Thermo-Mechanical Systems Branch are being used to recover and transform low-temperature waste heat into usable electric power, with a helping hand from NASA.
Derived from text
Aerospace Engineering; Energy Technology; Waste Heat; Thermal Energy; Stirling Cycle; Solar Energy; Energy Conversion; Thermoelectric Generators; Thermodynamics

20060022029 Integral Systems, Inc., Lanham, MD, USA
Satellite and Ground System Solutions at Your Fingertips
Spinoff 2005; 2005, pp. 92-93; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

In the summer of 1998, the blockbuster action movie Armageddon captivated audiences with a thrilling doomsday plot about a meteor the size of Texas that was racing towards the Earth. Though the premise of the movie was purely fictional, the unfortunate reality is that near-Earth asteroids such as the one portrayed in the film do exist. On December 23, 2004, NASA announced that an asteroid it anticipated to pass near the Earth on April 13, 2029, had been assigned the highest score to date on the universally used Torino Impact Hazard Scale. At first, the flyby distance for the asteroid, dubbed MN4, was uncertain and an Earth impact could not be ruled out. The odds of impact were initially believed to be 1 in 300, high enough to merit special monitoring by astronomers around the world, but were then escalated to 1 in 37 on December 27. NASA officials noted, however, that these odds should not be of public concern, since they were likely to change on a day-to-day basis as new data were received. The officials were correct in their assertion, as any chances of an impact with Earth in 2029 were completely ruled out later that same day. Integral Systems, Inc., a leading provider of satellite ground systems and the first company to offer an integrated suite of commercial-off-the-shelf software products for satellite command and control, is helping NASA keep a careful watch for any close-encountering asteroids with its tracking technology. The company supported the first NASA Discovery mission, the Near Earth Asteroid Rendezvous (NEAR) program, back in 1996, and has expanded its business by building more ground systems for a greater variety of satellites than any other company in the world. (NASA has since launched seven more Discovery missions, with the eighth lifting off earlier this year.) The experience gained from the company s participation in developing satellite command and control ground systems for the NEAR program has bolstered its flagship product line, the EPOCH Integrated Product Suite (IPS), first featured in Spinoff 1997, and led to the creation of its latest product, the Skylight Direct Broadcast Ground Terminal.
Derived from text
Satellite Control; Flyby Missions; Asteroids; Hazards; Command and Control; Near Earth Asteroid Rendezvous Mission

20060022030 Southwest Research Inst., San Antonio, TX, USA
Structural Analysis Made 'NESSUSary'
Spinoff 2005; 2005, pp. 94-95; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Everywhere you look, chances are something that was designed and tested by a computer will be in plain view. Computers are now utilized to design and test just about everything imaginable, from automobiles and airplanes to bridges and boats, and elevators and escalators to streets and skyscrapers. Computer-design engineering first emerged in the 1970s, in the automobile and aerospace industries. Since computers were in their infancy, however, architects and engineers during the time were limited to producing only designs similar to hand-drafted drawings. (At the end of 1970s, a typical computer-aided design system was a 16-bit minicomputer with a price tag of $125,000.) Eventually, computers became more affordable and related software became more sophisticated, offering designers the 'bells and whistles' to go beyond the limits of basic drafting and rendering, and venture into more skillful applications. One of the major advancements was the ability to test the objects being designed for the probability of failure. This advancement was especially important for the aerospace industry, where complicated and expensive structures are designed. The ability to perform reliability and risk assessment without using extensive hardware testing is critical to design and certification. In 1984, NASA initiated the Probabilistic Structural Analysis Methods (PSAM) project at Glenn Research Center to develop analysis methods and computer programs for the probabilistic structural analysis of select engine components for current Space Shuttle and future space propulsion systems. NASA envisioned that these methods and computational tools would play a critical role in establishing increased system performance and durability, and assist in structural system qualification and certification. Not only was the PSAM project beneficial to aerospace, it paved the way for a commercial risk- probability tool that is evaluating risks in diverse, down- to-Earth application
Author
Structural Analysis; Computer Aided Design; Aerospace Systems; Computer Design; Aerospace Industry; Reliability; Risk; Assessments

20060022031 Seismic Entertainment, San Francisco, CA, USA
Software of Seismic Proportions Promotes Enjoyable Learning
Spinoff 2005; 2005, pp. 96-97; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

While working for NASA, Jack Sculley and Terry Brooks had a revelation. They wanted to find a novel and unique way to present the scientific principles of NASA research to the public, so as to not only enlighten, but entertain. Suddenly, their revelation morphed into something even grander. 'Why stop at NASA?' they asked themselves. With this thought, Sculley and Brooks left NASA and set out to convey voluminous scientific findings from different organizations in the form of digital, interactive media that would enhance the exploration and adventure interests of people of all ages. Sculley, a former researcher at Ames Research Center, the Jet Propulsion Laboratory (JPL), and Apple, Inc. s and LucasFilm Ltd. s multimedia labs, and Brooks, a former public information officer at JPL and an Emmy award-winning documentary film producer, founded Seismic Entertainment in 1989 to communicate their 'edutainment' ideas. The two acknowledge that NASA has provided much of the inspiration and content for Seismic Entertainment over the past decade and a half. Additionally, Sculley s experience as a virtual reality and Mars specialist and Brooks s experience creating NASA public access programs were significant to the San Francisco-based company s success. Its most recent project, 'Inside NASA,' provides virtual tours of NASA s field centers and allows for a comprehensive focus on the broad range of NASA programs for the benefit of the general public
Derived from text
Software Engineering; Virtual Reality; Multimedia; NASA Programs

20060022032 Western Environmental Technology Labs., Inc., Philomath, OR, USA
Then Why Do They Call Earth the Blue Planet?
Spinoff 2005; 2005, pp. 62-63; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

While the most common photographs of Earth taken from space show the planet covered in blue water, NASA has managed to produce detailed color images, using satellite imagery, that show the remarkable variation of colors that actually make up the oceanic surface. An ocean s color is determined by the interaction of surface waters with sunlight, and surface waters can contain any number of different particles and dissolved substances, which could then change the color. Then Why Do They Call Earth the Blue Planet? The particles are mostly phytoplankton, the microscopic, single-celled ocean plants that are the primary food source for much marine life. Remote detection of phytoplankton provides information about the uptake

and cycling of carbon by the ocean through photosynthesis, as well as the overall health of the water. Inorganic particles and substances dissolved in the water also affect its color, particularly in coastal regions. Satellite images can be used to calculate the concentrations of these materials in surface waters, as well as the levels of biological activity. The satellites allow a global view that is not available from ship or shore. NASA s orbiting satellites offer a unique vantage point for studying the oceans. By resolving the biological, chemical, and physical conditions in surface waters, they have allowed the oceanographic community to make huge leaps in its understanding of oceanographic processes on regional and global fronts. The study of ocean color, in particular, has been integral in helping researchers understand the natural and human-induced changes in the global environment and establishing the role of the oceans in the biochemical cycles of elements that influence the climate and the distribution of life on Earth.
Derived from text
Activity (Biology); Biochemistry; Earth (Planet); Marine Biology; Photosynthesis; Satellite Imagery; Health; Life Sciences

20060022033 PureSense Environmental, Inc., Emeryville, CA, USA
Water and Air Measures That Make 'PureSense'
Spinoff 2005; 2005, pp. 68-71; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Each day, we read about mounting global concerns regarding the ability to sustain supplies of clean water and to reduce air contamination. With water and air serving as life s most vital elements, it is important to know when these environmental necessities may be contaminated, in order to eliminate exposure immediately. The ability to respond requires an understanding of the conditions impacting safety and quality, from source to tap for water, and from outdoor to indoor environments for air. Unfortunately, the 'time-to-know' is not immediate with many current technologies, which is a major problem, given the greater likelihood of risky situations in today s world. Accelerating alert and response times requires new tools, methods, and technologies. New solutions are needed to engage in more rapid detection, analysis, and response. This is the focus of a company called PureSense Environmental, Inc., which evolved out of a unique relationship with NASA. The need for real-time management and operations over the quality of water and air, and the urgency to provide new solutions, were reinforced by the events of September 11, 2001. This, and subsequent events, exposed many of the vulnerabilities facing the multiple agencies tasked with working in tandem to protect communities from harmful disaster. Much has been done since September 11 to accelerate responses to environmental contamination. Partnerships were forged across the public and private sectors to explore, test, and use new tools. Methods and technologies were adopted to move more astutely from proof-of-concept to working solutions.
Derived from text
Air Quality; Real Time Operation; Water; Detection; Contamination; Proving

20060022034 Orbital Technologies Corp., Madison, WI, USA
NASA's Growing Commitment: The Space Garden
Spinoff 2005; 2005, pp. 40-41; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Astronauts cannot live on dehydrated ice cream alone. Like everyone else, they need their vegetables. Enter VEGGIE, the Deployable Vegetable System, currently under development by Orbital Technologies Corporation (ORBITEC). VEGGIE is the latest in a long line of vegetable production units ORBITEC is currently working on, with NASA assistance, to grow salad crops to supplement prepackaged foods during long stays in space. The primary goal of the VEGGIE project is to provide flight crews with palatable, nutritious, and safe sources of fresh food with minimal volume and operational resources. In addition, ORBITEC recognizes the age-old adage that gardening is good for the soul, and it acknowledges that gardens are beneficial for relaxation and recreation. As evidence, astronauts on the International Space Station (ISS), who often stay for periods of 6 months, have been enjoying plant experiments, which provide them with much missed greenery and can occupy valuable free time with an enjoyable task. VEGGIE is a project that grew out of technology developed by ORBITEC for the Biomass Production System (BPS). The BPS is equivalent in size to a Space Shuttle middeck locker, and provides four plant growth chambers. Each chamber has independent control of temperature, humidity, nutrient and water delivery, lighting, and atmospheric composition. The BPS flew to the ISS in 2002, and astronaut Dan Bursch had positive comments about his interaction with the plants while in orbit. Astronaut Peggy Whitson had similarly positive remarks during the following expedition while she was growing soybeans for another experiment. Whitson reflects on her time in space with the plantings on Expedition 5, 'Although it doesn t sound like much, it was really exciting to see something green. I assumed that this was just because I really enjoy plants, but it surprised me that both of my crewmates were just as excited. They wanted photos of themselves with the plants and asked if they could eat some of them, too!' The astronauts did not eat the plants, but these

initial experiments gave the researchers information they needed about the basics of growing crops in space.
Derived from text
Vegetables; Biomass; Farm Crops; Flight Crews

20060022035 Penske Racing, Mooresville, NC, USA, STC Catalysts, Inc., Hampton, VA, USA
From Rockets to Racecars
Spinoff 2005; 2005, pp. 18-19; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

NASA s Langley Research Center scientists developed a family of catalysts for low- temperature oxidation of carbon monoxide and other gases. The catalysts provide oxidation of both carbon monoxide and formaldehyde at room temperature without requiring any energy input, just a suitable flow of gas through them. Originally designed as part of an atmospheric satellite project, where the catalysts were intended to recycle and recapture carbon dioxide to enhance the operational life of carbon dioxide lasers, the entire system was made to be rugged, long-lived, and fail-safe. The low-temperature oxidation catalysts can be produced and coated onto various catalyst supports, including porous ceramic monoliths and beads, which means that they can be integrated into existing designs, made to fit in limited space, and fashioned into a variety of geometrically different products. Although the satellite project was never launched, the resulting catalysts are doing great things here on Earth, with current applications in the high-speed motor sports arena as air purifiers, so professional racecar drivers do not get carbon monoxide poisoning. Future benefits may extend even further.
Author
Carbon Monoxide Poisoning; Catalysts; Fail-Safe Systems; Purification; Porosity

20060022036 Turnkey Design Services, LLC, Blue Island, IL, USA
Big Results From a Smaller Gearbox
Spinoff 2005; 2005, pp. 107; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Many people will be sad to see the Hubble Space Telescope go, as it was the first instrument of its kind to provide us with such a wealth of imagery and information about the galaxy. The telescope has served us well since its launch in spring of 1990, but it is nearly time for its retirement. The science, however, will continue, as NASA plans the launch of a new, more modern orbiting telescope, the James Webb Space Telescope. Named after the man who ran NASA from 1961 to 1968, years fraught with the anxiety and uncertainty of the Space Race, the scope is scheduled for launch in fall of 2011. It is designed to study the earliest galaxies and some of the first stars formed after the Big Bang. NASA scientists at the Goddard Space Flight Center are busy developing the technologies to build this new machine. Many of the new technologies are available for commercial licensing and development. For example, the NASA Planetary Gear System technology developed to give precise nanometer positioning capabilities for the James Webb Space Telescope is now being employed by Turnkey Design Services, LLC (TDS), of Blue Island, Illinois, to improve electric motors. This revolutionary piece of technology allows more efficient operation of the motors, and is more cost- effective than traditional gearbox designs.
Derived from text
Transmissions (Machine Elements); James Webb Space Telescope; Electric Motors; Positioning; Imagery

20060022038 Makel Engineering, Inc., Chico, CA, USA
Hydrogen Sensors Boost Hybrids; Today's Models Losing Gas?
Spinoff 2005; 2005, pp. 10-11; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Advanced chemical sensors are used in aeronautic and space applications to provide safety monitoring, emission monitoring, and fire detection. In order to fully do their jobs, these sensors must be able to operate in a range of environments. NASA has developed sensor technologies addressing these needs with the intent of improving safety, optimizing combustion efficiencies, and controlling emissions. On the ground, the chemical sensors were developed by NASA engineers to detect potential hydrogen leaks during Space Shuttle launch operations. The Space Shuttle uses a combination of hydrogen and oxygen as fuel for its main engines. Liquid hydrogen is pumped to the external tank from a storage tank located several hundred feet away. Any hydrogen leak could potentially result in a hydrogen fire, which is invisible to the naked eye. It is important to detect the presence of a hydrogen fire in order to prevent a major accident. In the air, the same hydrogen-leak dangers are present. Stress and temperature changes can cause tiny cracks or holes to form in the tubes that line the Space Shuttle s main engine nozzle. Such defects could allow the hydrogen that is pumped through the nozzle during firing to escape.

Responding to the challenges associated with pinpointing hydrogen leaks, NASA endeavored to improve propellant leak-detection capabilities during assembly, pre-launch operations, and flight. The objective was to reduce the operational cost of assembling and maintaining hydrogen delivery systems with automated detection systems. In particular, efforts have been focused on developing an automated hydrogen leak-detection system using multiple, networked hydrogen sensors that are operable in harsh conditions.
Derived from text
Combustion Efficiency; Propellants; External Tanks; Hazards; Liquid Hydrogen; Detection

20060022039 Consumer Lightning Technologies, Inc., Asheville, NC, USA
Lightning Often Strikes Twice
Spinoff 2005; 2005, pp. 24-25; In English; See also 20060022016; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Contrary to popular misconception, lightning often strikes the same place twice. Certain conditions are just ripe for a bolt of electricity to come zapping down; and a lightning strike is powerful enough to do a lot of damage wherever it hits. NASA created the Accurate Location of Lightning Strikes technology to determine the ground strike point of lightning and prevent electrical damage in the immediate vicinity of the Space Shuttle launch pads at Kennedy Space Center. The area surrounding the launch pads is enmeshed in a network of electrical wires and components, and electronic equipment is highly susceptible to lightning strike damage. The accurate knowledge of the striking point is important so that crews can determine which equipment or system needs to be retested following a strike. Accurate to within a few yards, this technology can locate a lightning strike in the perimeter of the launch pad. As an added bonus, the engineers, then knowing where the lightning struck, can adjust the variables that may be attracting the lightning, to create a zone that will be less susceptible to future strikes.
Derived from text
Lightning; Electronic Equipment; Damage; Position (Location)

20060022040 Reading Information Technology, Inc., Reading, MA, USA
Celestial Software Scratches More Than the Surface
Spinoff 2005; 2005, pp. 80-81; In English; See also 20060022016; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

While NASA is preparing to send humans back to the Moon by 2020 and then eventually to Mars, the average person can explore the landscapes of these celestial bodies much sooner, without the risk and training, and without even leaving the comfort of home. Geological data and imagery collected from NASA missions are enabling anybody with computer access to virtually follow the footsteps of Apollo astronauts who walked on the Moon or trace the tracks of the exploration rovers currently on Mars.
Derived from text
NASA Programs; Celestial Bodies; Computer Programs; Terrain; Roving Vehicles; Geology

20060022041 NVision Solutions, Inc., Bay Saint Louis, MS, USA
Remote Sensing for Farmers and Flood Watching
Spinoff 2005; 2005, pp. 72-73; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

The Applied Sciences Directorate, part of NASA s Science Mission Directorate, makes use of the Agency s remote-sensing capabilities to acquire detailed information about our home planet. It uses this information for a variety of purposes, ranging from increasing agricultural efficiency to protecting homeland security. Sensors fly over areas of interest to detect and record information that sometimes is not even visible from the ground with the human eye. Scientists analyze these data for a variety of purposes and make maps of the areas. These maps are often used to answer questions about the environment, weather, natural resources, community growth, and natural disasters.
Derived from text
Remote Sensing; Agriculture; Earth Resources; Disasters

20060022042 ADMA Products, Inc., Hudson, OH, USA
Cost-Cutting Powdered Lubricant
Spinoff 2005; 2005, pp. 100-101; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Scientists at NASA's Glenn Research Center developed a high-temperature, solid lubricant coating material that is saving the manufacturing industry millions of dollars. The material came out of 3 decades of tribological research, work studying high-temperature friction, lubrication, and the wearing of interacting surfaces that are in relative motion. It was developed as a shaft coating deposited by thermal spraying to protect foil air bearings used in oil-free turbomachinery, like gas turbines, and is meant to be part of a larger project: an oil-free aircraft engine capable of operating at high temperatures with increased reliability, lowered weight, reduced maintenance requirements, and increased power. This advanced coating, PS300, is a self-lubricating bearing material containing chromium oxide, with additions of a low-temperature start up lubricant (silver) and a high-temperature lubricant, making it remarkably stable at high temperatures, and better suited than previously available materials for high-stress conditions. It improves efficiency, lowers friction, reduces emissions, and has been used by NASA in advanced aeropropulsion engines, refrigeration compressors, turbochargers, and hybrid electrical turbogenerators. PS300 is ideal in any application where lowered weight and reduced maintenance are desired, and high-temperature uses and heavy operating speeds are expected. It has notable uses for the Space Agency, but it has even further-reaching potential for the industrial realm.

Derived from text

High Temperature Lubricants; Solid Lubricants; Self Lubricating Materials; Coating; Shafts (Machine Elements); Turbomachinery

20060022043 Access Optical Networks, Inc., Naperville, IL, USA

Going End to End to Deliver High-Speed Data

Spinoff 2005; 2005, pp. 104-105; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

By the end of the 1990s, the optical fiber 'backbone' of the telecommunication and data-communication networks had evolved from megabits-per-second transmission rates to gigabits-per-second transmission rates. Despite this boom in bandwidth, however, users at the end nodes were still not being reached on a consistent basis. (An end node is any device that does not behave like a router or a managed hub or switch. Examples of end node objects are computers, printers, serial interface processor phones, and unmanaged hubs and switches.) The primary reason that prevents bandwidth from reaching the end nodes is the complex local network topology that exists between the optical backbone and the end nodes. This complex network topology consists of several layers of routing and switch equipment which introduce potential congestion points and network latency. By breaking down the complex network topology, a true optical connection can be achieved. Access Optical Networks, Inc., is making this connection a reality with guidance from NASA s nondestructive evaluation experts.

Derived from text

Telecommunication; Data Transmission; Communication Networks; High Speed; Bandwidth

20060022044 S-Bond Technologies, LLC, Lansdale, PA, USA

Advanced Joining Technology: Simple, Strong, and Secure

Spinoff 2005; 2005, pp. 106; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

The space-age materials that NASA employs in its spacecraft and satellites have different attributes than the building materials that can work for Earthly uses. These materials do not behave like the typical construction materials, and therefore, require new methods for construction. Work done at NASA s Langley Research Center in the realm of active solder joining has led to a new, self-bonding solder that enables high conductivity, as well as the metallic joining of carbon and ceramic materials to a wide range of metals. The original work involved evaluating high- and low-temperature joining technologies for joining carbon composite structures for use in thermal management and reusable launch vehicles. The initial plan for this innovation was to lower the weight of battery packs in satellites. It was a success. NASA scientists found use for this technology in fabricating a thermal management package for battery compartments in the Earth Observing System (EOS) satellites, but it is also being used by the Agency for space radiator panels. Because it is light, simple to use, and economical, NASA will likely find other uses for this solder, just as outside of the Space Agency, this unique bond is finding many practical applications.

Derived from text

Joints (Junctions); Bonding; Spacecraft Construction Materials; Composite Structures; Metals; Ceramics; Carbon

20060022045 Universal Detection Technology, USA

Keeping the Air Clean and Safe: An Anthrax Smoke Detector

Spinoff 2005; 2005, pp. 22-23; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Scientists at work in the Planetary Protection division at NASA s Jet Propulsion Laboratory (JPL) sterilize everything before blasting it to the Red Planet. They take great pains to ensure that all spacecraft are void of bacterial life, especially the microscopic bacteria that can live hundreds of years in their spore states. No one is quite sure what Earthly germs would do on Mars, but scientists agree that it is safest to keep the Martian terrain as undisturbed as possible. Errant Earth germs would also render useless the instruments placed on exploration rovers to look for signs of life, as the life that they registered would be life that came with them from Earth. A team at JPL, headed by Dr. Adrian Ponce, developed a bacterial spore-detection system that uses a simple and robust chemical reaction that visually alerts Planetary Protection crews. It is a simple air filter that traps micron-sized bacterial spores and then submits them to the chemical reaction. When the solution is then viewed under an ultraviolet light, the mixture will glow green if it is contaminated by bacteria. Scientists can then return to the scrubbing and cleaning stages of the sterilization process to remove these harmful bacteria. The detection system is the space-bound equivalent of having your hands checked for cleanliness before being allowed to the table; and although intended to keep terrestrial germs from space, this technology has awesome applications here on Mother Earth. The bacterial spore-detection unit can recognize anthrax and other harmful, spore-forming bacteria and alert people of the impending danger. As evidenced in the anthrax mailings of fall 2001 in the USA, the first sign of anthrax exposure was when people experienced flu-like symptoms, which unfortunately, can take as much as a week to develop after contamination. Anthrax cost 5 people their lives and infected 19 others; and the threat of bioterrorism became a routine concern, with new threats popping up nearly everyday. The attacks threatened the safety that so many Americans took for granted, as the very air that people breathed became suspect. Any building with a circulation system, where large groups congregate, was now a potential target. Derived from text

Air Filters; Smoke Detectors; Contamination; Bacteria; Sterilization; Infectious Diseases; Detection

20060022046 TMIO, LLC, Cleveland, OH, USA

Cooking Dinner at Home--From the Office

Spinoff 2005; 2005, pp. 36-37; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

It is well past quitting time, but you are still stuck in the office. Your spouse left work over an hour ago, but is caught in bumper-to-bumper traffic. As a result, neither of you were available to pick up your daughter on time from her soccer game. If your son hadn’t gotten detention at school today, which also made him late for work, he could have picked her up. The next thing you know, it is already 8:30 at night, and your family members are finally all together under the same roof. No one has had a bite to eat since lunch, and dinner certainly isn’t going to cook itself, or is it? For those who are all too familiar with this situation, it might be time to welcome the oven of the future into your homes: the ConnectIo Intelligent Oven, brought to you by TMIO, LLC, of Cleveland. Applying the same remote command and control concepts that NASA uses to run experiments on the International Space Station (ISS), ConnectIo allows its owners to cook dinner from the road, via a cell phone, personal digital assistant, or Internet connection.

Derived from text

Remote Control; Ovens; Eating; Command and Control

20060022047 Western Solutions, Inc., West Chester, PA, USA, Toxicological and Environmental Associates, Baton Rouge, LA, USA

Valiant ‘Zero-Valent’ Effort Restores Contaminated Grounds

Spinoff 2005; 2005, pp. 64-65; In English; See also 20060022016; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Dense non-aqueous phase liquids (DNAPLs) are chemical compounds that can contaminate soil and groundwater to the point of irreparability. These substances are only slightly soluble in water, and are much denser than water. Because of their solubility, DNAPLs form separate liquid phases in groundwater, and because of their density, DNAPLs sink in aquifers instead of floating at the water table, making it extremely difficult to detect their presence. If left untreated in the ground, they can taint fresh water sources. Common DNAPLs include chlorinated hydrocarbon compounds such as carbon tetrachloride, chloroform, tetrachloroethylene, and trichloroethylene. Trichloroethylene was used during the early days of the Space Program, as a solvent for flushing rocket engines, and for metal cleaning and degreasing of equipment, electronics, and heavy machinery. As a result, areas of Cape Canaveral s Launch Complex 34, the site of several historic Saturn rocket launches

occurring from 1959 to 1968, were polluted with chlorinated DNAPLs. Through the direction and guidance of Dr. Jacqueline Quinn, an environmental engineer in the Spaceport Engineering and Technology Directorate at NASA s Kennedy Space Center, a biodegradable environmental cleanup technology was developed to reductively dechlorinate DNAPL sources in polluted water at Launch Complex 34. It was important for Kennedy to nip this problem in the bud, in light of the fact that the Space Center is also a National Wildlife Refuge, home to thousands of shorebirds, endangered sea turtles and eagles, manatees, alligators, and diverse habitats that include brackish marshes and salt water estuaries. The success in remediating this historic launch site has led to numerous commercial applications that are restoring the health of our environmental surroundings.
Derived from text
Biodegradability; Chlorocarbons; Contamination; Environmental Cleanup; Hydrocarbons; Launching Sites; Liquid Phases

20060022048 Lucidoc Corp., Redmond, WA, USA
Software to Manage the Unmanageable
Spinoff 2005; 2005, pp. 86-87; In English; See also 20060022016; Original contains color illustrations; No Copyright;
Avail.: CASI: E99, Hardcopy; No Charge

In 1995, NASA s Jet Propulsion Laboratory (JPL) contracted Redmond, Washington-based Lucidoc Corporation, to design a technology infrastructure to automate the intersection between policy management and operations management with advanced software that automates document workflow, document status, and uniformity of document layout. JPL had very specific parameters for the software. It expected to store and catalog over 8,000 technical and procedural documents integrated with hundreds of processes. The project ended in 2000, but NASA still uses the resulting highly secure document management system, and Lucidoc has managed to help other organizations, large and small, with integrating document flow and operations management to ensure a compliance-ready culture.
Derived from text
Management Systems; Computer Programs; Catalogs (Publications); Layouts

20060022049 STAR Cryoelectronics, LLC, Los Alamos, NM, USA
Tracking Electromagnetic Energy With SQUIDs
Spinoff 2005; 2005, pp. 88-89; In English; See also 20060022016; Original contains color illustrations; No Copyright;
Avail.: CASI: E99, Hardcopy; No Charge

A superconducting quantum interference device (SQUID) is a gadget used to measure extremely weak signals, specifically magnetic flux. It can detect subtle changes in energy, up to 100 billion times weaker than the electromagnetic energy required to move a compass needle. SQUIDs are used for a variety of testing procedures where extreme sensitivity is required and where the test instrument need not come into direct contact with the test subject. NASA uses SQUIDs for remote, noncontact sensing in a variety of venues, including monitoring the Earth s magnetic field and tracking brain activity of pilots. Scientists at NASA s Goddard Space Flight Center have been making extensive use of this technology, from astrophysical research, to tracking the navigational paths of bees in flight to determine if they are using internal compasses. These very sensitive measurement devices have a wide variety of uses within NASA and even more uses within the commercial realm.
Derived from text
SQUID (Detectors); Superconductors (Materials); Remote Sensing; Astrophysics; Geomagnetism; Magnetic Flux

20060022050 Phoenix International Ltd., Brookfield, WI, USA
Popping a Hole in High-Speed Pursuits
Spinoff 2005; 2005, pp. 14-15; In English; See also 20060022016; Original contains color illustrations; No Copyright;
Avail.: CASI: E99, Hardcopy; No Charge

NASA s Plum Brook Station, a 6,400-acre, remote test installation site for Glenn Research Center, houses unique, world-class test facilities, including the world s largest space environment simulation chamber and the world s only laboratory capable of full-scale rocket engine firings and launch vehicle system level tests at high-altitude conditions. Plum Brook Station performs complex and innovative ground tests for the U.S. Government (civilian and military), the international aerospace community, as well as the private sector. Popping a Hole in High-Speed Pursuits Recently, Plum Brook Station s test facilities and NASA s engineering experience were combined to improve a family of tire deflating devices (TDDs) that helps law enforcement agents safely, simply, and successfully stop fleeing vehicles in high-speed pursuit
Derived from text
Aerospace Industry; Ground Tests; Pressure Reduction; Test Facilities; Space Environment Simulation; Launch Vehicles; Inflatable Structures

20060022051 Coherent Technologies, Inc., Louisville, CO, USA
Monitoring Wake Vortices for More Efficient Airports
Spinoff 2005; 2005, pp. 16-17; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Wake vortices are generated by all aircraft during flight. The larger the aircraft, the stronger the wake, so the Federal Aviation Administration (FAA) separates aircraft to ensure wake turbulence has no effect on approaching aircraft. Currently, though, the time between planes is often larger than it needs to be for the wake to dissipate. This unnecessary gap translates into arrival and departure delays, but since the wakes are invisible, the delays are nearly inevitable. If, however, the separation between aircraft can be reduced safely, then airport capacity can be increased without the high cost of additional runways. Scientists are currently studying these patterns to identify and introduce new procedures and technologies that safely increase airport capacity. NASA, always on the cutting edge of aerospace research, has been contributing knowledge and testing to these endeavors.
Derived from text
Wakes; Vortices; Airports; Runways; Turbulence

20060022053 Avo Photonics, Horsham, PA, USA
The Space Laser Business Model
Spinoff 2005; 2005, pp. 110-111; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Creating long-duration, high-powered lasers, for satellites, that can withstand the type of optical misalignment and damage dished out by the unforgiving environment of space, is work that is unique to NASA. It is complicated, specific work, where each step forward is into uncharted territory. In the 1990s, as this technology was first being created, NASA gave free reign to a group of ‘laser jocks’ to develop their own business model and supply the Space Agency with the technology it needed. It was still to be a part of NASA as a division of Goddard Space Flight Center, but would operate independently out of a remote office. The idea for this satellite laboratory was based on the Skunk Works concept at Lockheed Martin Corporation. Formerly known as the Lockheed Corporation, in 1943, the aerospace firm, realizing that the type of advanced research it needed done could not be performed within the confines of a larger company, allowed a group of researchers and engineers to essentially run their own microbusiness without the corporate oversight. The Skunk Works project, in Burbank, California, produced America s first jet fighter, the world s most successful spy plane (U-2), the first 3-times-the-speed-of-sound surveillance aircraft, and the F-117A Nighthawk Stealth Fighter. Boeing followed suit with its Phantom Works, an advanced research and development branch of the company that operates independent of the larger unit and is responsible for a great deal of its most cutting-edge research. NASA s version of this advanced business model was the Space Lidar Technology Center (SLTC), just south of Goddard, in College Park, Maryland. Established in 1998 under a Cooperative Agreement between Goddard and the University of Maryland s A. James Clark School of Engineering, it was a high-tech laser shop where a small group of specialists, never more than 20 employees, worked all hours of the day and night to create the cutting- edge technology the Agency required of them. Drs. Robert Afzal and Joseph Dallas were directors of the SLTC, and led the development and production of active spaceborne, remote-sensing, optical instruments. As a pioneer in the area of photonics, Dr. Dallas led basic research, development, and production of semiconductor laser diode products, improving coupling efficiency through novel physical optics modeling and intracavity phase-correction techniques. He worked for NASA for 15 years, 11 of which were as a civil servant, and 4 of which were as a contractor.
Derived from text
Spaceborne Lasers; Aerospace Engineering; Satellite Instruments; Photonics; Optical Equipment; Semiconductor Lasers

20060022054 Western DataCom Co., Inc., Westlake, OH, USA
Secure Networks for First Responders and Special Forces
Spinoff 2005; 2005, pp. 30-31; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

When NASA needed help better securing its communications with orbiting satellites, the Agency called on Western DataCom Co., Inc., to help develop a prototype Internet Protocol (IP) router. Westlake, Ohio-based Western DataCom designs, develops, and manufactures hardware that secures voice, video, and data transmissions over any IP-based network. The technology that it jointly developed with NASA is now serving as a communications solution in military and first-response situations.
Derived from text
Data Transmission; Transponders; Video Data; Protocol (Computers)

20060022055 Eclypse International Corp., Corona, CA, USA
Technology That's Ready and Able to Inspect Those Cables
Spinoff 2005; 2005, pp. 26-29; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Attempting to locate a malfunctioning wire in a complex bundle of wires or in a cable that is concealed behind a wall is as difficult as trying to find a needle in a haystack. The result of such an effort can also be costly, time-consuming, and frustrating, whether it is the tedious process of examining cable connections for the Space Shuttle or troubleshooting a cable television hookup. Furthermore, other maintenance restrictions can compound the effort required to locate and repair a particular wiring problem. For example, on the Space Shuttle, once a repair is completed, all systems that have a wire passing through any of the connectors that were disconnected during troubleshooting are affected and, therefore, must undergo retesting, an arduous task that is completely unrelated to the original problem. In an effort to streamline wire inspection and maintenance, two contractors supporting NASA's Kennedy Space Center invented the Standing Wave Reflectometer (SWR) in 1999. In doing so, they leveraged technology that was first developed to detect problems that could lead to aircraft accidents, such as the one that resulted in the catastrophic failure of TWA flight 800 in 1996. The SWR performs a non-intrusive inspection that verifies the condition of electrical power and signal-distribution systems inside the Space Shuttle orbiters. Such testing reduces processing delays and ensures safe operation of these systems.
Derived from text
Communication Cables; Inspection; Reflectometers; Malfunctions; Wire; Nonintrusive Measurement

20060022056 ILC Dover, Frederica, DE, USA, SeliCor, Inc., Austin, TX, USA
Space Suit Spins
Spinoff 2005; 2005, pp. 32-35; In English; See also 20060022016; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Space is a hostile environment where astronauts combat extreme temperatures, dangerous radiation, and a near-breathless vacuum. Life support in these unforgiving circumstances is crucial and complex, and failure is not an option for the devices meant to keep astronauts safe in an environment that presents constant opposition. A space suit must meet stringent requirements for life support. The suit has to be made of durable material to withstand the impact of space debris and protect against radiation. It must provide essential oxygen, pressure, heating, and cooling while retaining mobility and dexterity. It is not a simple article of clothing but rather a complex modern armor that the space explorers must don if they are to continue exploring the heavens
Derived from text
Space Suits; Life Support Systems; Durability; Clothing

20060022057 Quantum Devices, Inc., Barneveld, WI, USA
Lighting the Way for Quicker, Safer Healing
Spinoff 2005; 2005, pp. 6-7; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Who's to say that a little light can t go a long way? Tiny light-emitting diode (LED) chips used to grow plants in space are lighting the way for cancer treatment, wound healing, and chronic pain alleviation on Earth. In 1993, Quantum Devices, Inc. (QDI), of Barneveld, Wisconsin, began developing the HEALS (High Emissivity Aluminiferous Light-emitting Substrate) technology to provide high-intensity, solid-state LED lighting systems for NASA Space Shuttle plant growth experiments. The company evolved out of cooperative efforts with the Wisconsin Center for Space Automation and Robotics (WCSAR) at the University of Wisconsin-Madison a NASA center for the Commercial Development of Space. Ronald W. Ignatius, QDI s president and chairman, represented one of WCSAR s industrial partners at the time. WCSAR was conducting research on light sources for promoting food growth within closed environments where humans would be present for a long duration, such as the Space Shuttle and the International Space Station. With the support of WCSAR, Ignatius experimented with LEDs, which provide high-energy efficiency and virtually no heat, despite releasing waves of light 10 times brighter than the Sun. Ignatius admits that some scientists involved in the project were skeptical at first, thinking that the idea of using LEDs to promote plant growth was far-fetched. The experiments, however, demonstrated that red LED wavelengths could boost the energy metabolism of cells to advance plant growth and photosynthesis. This finding prompted Ignatius to develop a line of LED products that emit the exact wavelength of light that plants use in photosynthesis. Our company gives credit to Dr. Ray Bula, the director of WCSAR, for having the foresight to go against the prevailing dogma of the time and design the first plant experiment using monochromatic light to grow lettuce plants, Ignatius proclaims. In 1989, Ignatius formed QDI to bring the

salt grain-sized LEDs to market, and in October 1995, the light sources made their Space Shuttle flight debut on the second U.S. Microgravity Laboratory Spacelab mission (STS-73, Columbia)
Derived from text
Brightness; Illuminating; Light Emitting Diodes; Light Sources; Closed Ecological Systems

20060022058 Luna Innovations, Inc., VA, USA
NASA's Radio Frequency Bolt Monitor: A Lifetime of Spinoffs
Spinoff 2005; 2005, pp. 102-103; In English; See also 20060022016; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

This story begins in the 1970s, when Dr. Joseph Heyman, a young scientist at NASA s Langley Research Center, was asked to support the investigation of a wind tunnel accident at a sister center. Although the work was outside of his physics background, it sparked a research focus that guided his lengthy NASA career and would earn him a slew of accolades, including NASA s highest award medals for Exceptional Leadership, Exceptional Achievement, and Exceptional Service; the coveted Silver Snoopy Astronaut Award for Space Shuttle Return to Flight; and the Arthur Fleming Award for being one of the Top Ten Federal Scientists in Government Service. He won 30 additional NASA awards, including the Agency s Invention of the Year and the Agency s highest award for technology transfer, and was the only person to ever win 4 R&D 100 Awards. Back in 1973, though, Heyman was a young civil servant with a background in physics who was asked to sit on an accident review panel. The panel met at Ames Research Center, in Moffet Field, California, and after considerable investigation, concluded that a high-pressure pebble heater used for heating gas had failed, due to improperly tightened bolts in a 1,000-pound gate valve control section. The accident showered the facility with incendiary ceramic spheres and nearly a ton of metal, but, luckily, caused no injuries. Heyman returned to Langley and began work on a solution. He developed an ultrasonic device that would measure bolt elongation, as opposed to torque, the factor typically measured in testing bolt preload or tension. Torque measurement can lead to load errors, with miscalculations as high as 80 percent that can be passed over during installation. Bolt stretch, however, is nearly always accurate to 1 percent or better. Within 1 month, he had an acoustic resonance solution that accurately determined bolt elongation. He assumed his work on this project had ended, but it was actually the start of nearly 15 years of work perfecting, improving, inventing, and modifying the 'bolt monitor', all the while, filing numerous patents, presenting papers, and holding demonstrations as the technology matured. Industry engineers challenged Heyman s inventiveness, and reminded the physicist that most bolts are not perfect resonators, and that early devices required that the bolt have reasonably flat and parallel faces. The U.S. Geological Survey asked NASA for help in determining the load in mine roof bolts, which are 8- to 10-feet-long and rough cut. To solve that problem, Heyman modified the original device to operate at a lower frequency and to generate propagation modes that could be used to 'lock' the instrument on a particular mode. Further work in this vein led to the development of the Pulsed Phase Locked Loop (P2L2) that worked on the mine bolts. The next set of problems involved high-strength bolts with head markings. For this solution, Heyman invented a modified P2L2 that tracked a specific phase point in the measurement wave. This class of instrumentation, well suited to measuring small changes in acoustic velocity, won the NASA 'Invention of the Year' award in 1982. Other scientists and engineers have continued the evolution of this technology both inside NASA and outside of the Agency. Within NASA, the technology has been improved for medical applications, with a particular focus on intercranial pressure (ICP) monitoring.
Derived from text
Radio Frequencies; Bolts; Ultrasonics; Resonators; Propagation Modes; Loads (Forces); Acoustic Resonance; Acoustic Velocity

20060022059 Setra Systems, Inc., Boxborough, MA, USA
Low-Pressure Generator Makes Cleanrooms Cleaner
Spinoff 2005; 2005, pp. 108-109; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Scientists at NASA's Kennedy Space Center work in cleanrooms: laboratories with high degrees of cleanliness provided by strict control of particles such as dust, lint, or human skin. They are contaminant-free facilities, where the air is repeatedly filtered, and surfaces are smooth to prevent particles from getting lodged. Technicians working in these environments wear specially designed cleanroom 'bunny suits' and booties over their street clothes, as well as gloves and face masks to avoid any contamination that may be imparted from the outside world. Even normal paper is not allowed in cleanrooms, only cleanroom low-particulate paper. These are sensitive environments where precision work, like the production of silicon chips or hard disk drives, is performed. Often in cleanrooms, positive air pressure is used to force particles outside of the isolated area. The air pressure in the Kennedy cleanrooms is monitored using high-accuracy, low-differential pressure transducers that require

periodic calibration. Calibration of the transducers is a tricky business. In prior years, the analysis was performed by sending the transducers to the Kennedy Standards Laboratory, where a very expensive cross-floated, labor- intensive, dead-weight test was conducted. In the early 1990s, scientists at Kennedy determined to develop a technique and find equipment to perform qualification testing on new low-differential pressure transducers in an accurate, cost-effective manner onsite, without requiring an environmentally controlled room. They decided to use the highly accurate, cost-effective Setra Model C264 as the test transducer. For qualification testing of the Setra, though, a portable, lower-cost calibrator was needed that could control the differential pressure to a high degree of resolution and transfer the accuracy of the Standards Laboratory testing to the qualification testing. The researchers decided that, to generate the low-differential pressure setpoints needed for qualification testing, very small gas volume changes could be made against the test article, and a corresponding pressure change would be detected by a pressure standard. This allowed the researchers to recreate cleanroom air pressure settings without the use of a cleanroom. Thus was born the low-differential pressure generator. In 1993, a prototype was developed using a pair of PVC tanks, a volume controller, and a 1-pound-per-square-inch pressure standard. By 1995, the prototype was perfected into the unit that is still used today.
Derived from text
Calibrating; Low Pressure; Pressure Sensors; Transducers; In Situ Measurement

20060022060 Microcide, Inc., Troy, MI, USA
Washing Away the Worries About Germs
Spinoff 2005; 2005, pp. 78-79; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Fresh fruits and vegetables have been in demand by orbiting astronauts since the early days of the Space Shuttle. As one can imagine, however, oranges, onions, tomatoes, garlic, and other fresh items can provide a cornucopia of smells in a closed environment such as the Space Shuttle or the International Space Station (ISS), especially when they begin to perish. It does not help that they are loaded onto the Space Shuttle up to 24 hours in advance of a launch, and that the on-orbit shelf life is just 2 to 3 days for most, due to a lack of refrigeration. While such produce adds significant variety to astronauts diets and increases their morale, the odor that emanates from it as it ages can cause nausea. One of the last things astronauts need is associating this healthy fare with feelings of nausea. NASA is currently investigating the use of a commercial sanitation product it helped develop with private industry to thoroughly cleanse and, thus, increase the shelf life of fruits and vegetables being sent into space. Meanwhile, this product is ripe for the picking for consumers looking to do the same, and more, on Earth.
Derived from text
Closed Ecological Systems; Fruits; Vegetables; Storage Stability; Space Shuttles; Sanitation; International Space Station; Diets

20060022061 Plantronics, Inc., Santa Cruz, CA, USA
Crystal-Clear Communication a Sweet-Sounding Success
Spinoff 2005; 2005, pp. 54-57; In English; See also 20060022016; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

On July 20, 1969, millions were glued to their television sets when NASA astronaut Neil Armstrong offered these famous words via live broadcast, upon becoming the first man to ever step foot on the Moon. This historic transmission was delivered from Armstrong s headset to the headsets of Mission Control personnel at NASA, and then on to the world. To ensure that this message was delivered loud and clear to all, NASA collaborated with private industry to deliver the best headset-communication technology possible. Today, the heart of this technology beats in a high-end line of lightweight and wireless solutions for homes, offices, contact centers, and dispatch centers.
Derived from text
Broadcasting; Television Systems; Messages; Earphones

20060022062 Stottler Henke Associates, Inc., San Mateo, CA, USA
A Search Engine That's Aware of Your Needs
Spinoff 2005; 2005, pp. 82-83; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

Internet research can be compared to trying to drink from a firehose. Such a wealth of information is available that even the simplest inquiry can sometimes generate tens of thousands of leads, more information than most people can handle, and

more burdensome than most can endure. Like everyone else, NASA scientists rely on the Internet as a primary search tool. Unlike the average user, though, NASA scientists perform some pretty sophisticated, involved research. To help manage the Internet and to allow researchers at NASA to gain better, more efficient access to the wealth of information, the Agency needed a search tool that was more refined and intelligent than the typical search engine. Partnership NASA funded Stottler Henke, Inc., of San Mateo, California, a cutting-edge software company, with a Small Business Innovation Research (SBIR) contract to develop the Aware software for searching through the vast stores of knowledge quickly and efficiently. The partnership was through NASA s Ames Research Center.
Derived from text
Information Retrieval; Internets; Commerce

20060022063 Interface and Control Systems, Inc., West Melbourne, FL, USA
Fault-Detection Tool Has Companies 'Mining' Own Business
Spinoff 2005; 2005, pp. 84-85; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

A successful launching of NASA's Space Shuttle hinges heavily on the three Space Shuttle Main Engines (SSME) that power the orbiter. These critical components must be monitored in real time, with sensors, and compared against expected behaviors that could scrub a launch or, even worse, cause in- flight hazards. Since 1981, SSME faults have caused 23 scrubbed launches and 29 percent of total Space Shuttle downtime, according to a compilation of analysis reports. The most serious cases typically occur in the last few seconds before ignition; a launch scrub that late in the countdown usually means a period of investigation of a month or more. For example, during the launch attempt of STS-41D in 1984, an anomaly was detected in the number three engine, causing the mission to be scrubbed at T-4 seconds. This not only affected STS-41D, but forced the cancellation of another mission and caused a 2-month flight delay. In 2002, NASA s Kennedy Space Center, the Florida Institute of Technology, and Interface & Control Systems, Inc., worked together to attack this problem by creating a system that could automate the detection of mechanical failures in the SSMEs fuel control valves.
Derived from text
Fault Detection; Space Shuttle Main Engine; Real Time Operation; Failure; Flight Hazards

20060022083 NASA Johnson Space Center, Houston, TX, USA
Inflatable Structures: Test Results and Development Progress Since TransHab
Johnson, Chris; [2006]; 27 pp.; In English; Annual Technical Symposium 2006, 19 May 2006, Houston, TX, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

JSC's TransHab project was the first successful development program to prove the viability of inflatable habitats for space applications. Although TransHab was cancelled in 2000, significant progress has been made this past year by JSC engineers. Since February 2005, the following test articles have been manufactured and tested: 1 - An 88-in diameter restraint layer was pressure-tested to failure and reached an ultimate pressure of 197psi. This test article demonstrated the ability to build a 35-foot diameter inflatable with a factor of safety of 4.0 at 10.2 psi. 2 - An 88-in diameter restraint layer with a window frame incorporated into the restraint layer was tested to failure and reached an ultimate pressure of 197 psi. This test article demonstrated the ability to incorporate windows and other structural penetrations in the woven restraint layer without reducing its strength. 3 - An 88-inch diameter folding demonstrator that includes a bladder, restraint layer, and all of the MMOD shell layers was manufactured and assembled. This test article demonstrated an improved and simplified shell assembly and folding technique which installs pre-folded shell sections in a controlled manner. 4 - Fifth-scale MMOD hypervelocity test articles have demonstrated fiberglass as a viable material for a MMOD bumper shield which is cheaper and more readily available than previously used materials. In addition, four different full-scale advanced shape inflatable mockups have been manufactured and evaluated for applications such as lunar habitats, airlocks, and transfer tunnels.
Author
Lunar Shelters; Inflatable Structures; Lunar Construction Equipment; Space Colonies; Aerospace Environments

20060022085 NASA Johnson Space Center, Houston, TX, USA
Methodology and Assumptions of Contingency Shuttle Crew Support (CSCS) Calculations Using ISS Environmental Control and Life Support Systems
Prokhorov, Kimberlee; Shkedi, Brienne; [2006]; 12 pp.; In English; International Conference on Environmental Systems, 17-20 Jul. 2006, Norfolk, VA, USA
Contract(s)/Grant(s): WBS 769-06-01-01-01
Report No.(s): SAE-2006-01-2061; Copyright; Avail.: Other Sources

The current International Space Station (ISS) Environmental Control and Life Support (ECLS) system is designed to support an ISS crew size of three people. The capability to expand that system to support nine crew members during a Contingency Shuttle Crew Support (CSCS) scenario has been evaluated. This paper describes how the ISS ECLS systems may be operated for supporting CSCS, and the durations expected for the oxygen supply and carbon dioxide control subsystems. Author

Control Systems Design; Life Support Systems; Space Shuttle Orbiters; Spacecrews; Environmental Control; International Space Station

20060022140 NASA Johnson Space Center, Houston, TX, USA

New Direction of NASA Exploration Life Support

Chambliss, Joe; Lawson, B. Michael; Barta, Daniel J.; 2006; 10 pp.; In English; International Conference on Environmental Systems, 17-20 Jul. 2006, Norfolk, VA, USA; Original contains color illustrations

Contract(s)/Grant(s): 080-01-04

Report No.(s): SAE-2006-01-2241; Copyright; Avail.: Other Sources

NASA's activities in life support Research and Technology Development (R&TD) have changed in both focus and scope following implementation of recommendations from the Exploration System Architecture Study (ESAS). The limited resources available and the compressed schedule to conduct life support R&TD have required that future efforts address the needs of the Crew Exploration Vehicle (CEV), the Lunar Surface Access Module (LSAM) and Lunar Outpost (LO). Advanced Life Support (ALS) efforts related to long duration planetary bases have been deferred or canceled. This paper describes the scope of the new Exploration Life Support (ELS) project; how it differs from ALS, and how it supports critical needs for the CEV, LSAM and LO. In addition, this paper provides rationale for changes in the scope and focus of technical content within ongoing life support R&TD activities.

Author

Research and Development; Life Support Systems; Planetary Bases; Schedules

20060022535 NASA Johnson Space Center, Houston, TX, USA

Conducting Closed Habitation Experiments: Experience from the Lunar Mars Life Support Test Project

Barta, Daniel J.; Edeen, Marybeth A.; Henninger, Donald L.; January 2006; 1 pp.; In English; International Symposium on CLosed Habitation Experiments and Material Circulation Technology, 28-30 Sep. 2004, Aomori, Japan; No Copyright; Avail.: Other Sources; Abstract Only

The Lunar-Mars Life Support Test Project (LMLSTP) was conducted from 1995 through 1997 at the National Aeronautics and Space Administration s (NASA) Johnson Space Center (JSC) to demonstrate increasingly longer duration operation of integrated, closed-loop life support systems that employed biological and physicochemical techniques for water recycling, waste processing, air revitalization, thermal control, and food production. An analog environment for long-duration human space travel, the conditions of isolation and confinement also enabled studies of human factors, medical sciences (both physiology and psychology) and crew training. Four tests were conducted, Phases I, II, IIa and III, with durations of 15, 30, 60 and 91 days, respectively. The first phase focused on biological air regeneration, using wheat to generate enough oxygen for one experimental subject. The systems demonstrated in the later phases were increasingly complex and interdependent, and provided life support for four crew members. The tests were conducted using two human-rated, atmospherically-closed test chambers, the Variable Pressure Growth Chamber (VPGC) and the Integrated Life Support Systems Test Facility (ILSSTF). Systems included test articles (the life support hardware under evaluation), human accommodations (living quarters, kitchen, exercise equipment, etc.) and facility systems (emergency matrix system, power, cooling, etc.). The test team was managed by a lead engineer and a test director, and included test article engineers responsible for specific systems, subsystems or test articles, test conductors, facility engineers, chamber operators and engineering technicians, medical and safety officers, and science experimenters. A crew selection committee, comprised of psychologists, engineers and managers involved in the test, evaluated male and female volunteers who applied to be test subjects. Selection was based on the skills mix anticipated for each particular test, and utilized information from psychological and medical testing, data on the knowledge, experience and skills of the applicants, and team building exercises. The design, development, buildup and operation of test hardware and documentation followed the established NASA processes and requirements for test buildup and operation.

Author

Life Support Systems; Human Factors Engineering; Pressure Chambers; Regeneration (Engineering); Systems Integration; Air Purification; Confinement

20060022648 NASA Johnson Space Center, Houston, TX, USA
Emergency Oxygen System Evaluation for Exploration PLSS Applications
Heather, Paul; Vonau, Walt, Jr.; Conger, Bruce; January 2006; 10 pp.; In English
Report No.(s): SAE-2006-01-2208; Copyright; Avail.: Other Sources

The Portable Life Support System (PLSS) emergency oxygen system is being reexamined for the next generation of suits. These suits will be used for transit to Low Earth Orbit, the Moon and to Mars as well as on the surface of the Moon and Mars. Currently, the plan is that there will be two different sets of suits, but there is a strong desire for commonality between them for construction purposes. The main purpose of this paper is to evaluate what the emergency PLSS requirements are and how they might best be implemented. Options under consideration are enlarging the tanks on the PLSS, finding an alternate method of storage/delivery, or providing additional O2 from an external source. The system that shows the most promise is the cryogenic oxygen system with a composite dewar which uses a buddy system to split the necessary oxygen between two astronauts.
Author
Oxygen Supply Equipment; Portable Life Support Systems; Emergencies; Cryogenic Equipment

55
EXOBIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace Medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Sciences*.

20060022163 NASA Johnson Space Center, Houston, TX, USA
Planned Environmental Microbiology Aspects of Future Lunar and Mars Missions
Ott, C. Mark; Castro, Victoria A.; Pierson, Duane L.; [2006]; 1 pp.; In English; 4th International Workshop on Space Microbiology, 12-14 Sep. 2006, Kaluga, Russia; No Copyright; Avail.: Other Sources; Abstract Only

With the establishment of the Constellation Program, NASA has initiated efforts designed similar to the Apollo Program to return to the moon and subsequently travel to Mars. Early lunar sorties will take 4 crewmembers to the moon for 4 to 7 days. Later missions will increase in duration up to 6 months as a lunar habitat is constructed. These missions and vehicle designs are the forerunners of further missions destined for human exploration of Mars. Throughout the planning and design process, lessons learned from the International Space Station (ISS) and past programs will be implemented toward future exploration goals. The standards and requirements for these missions will vary depending on life support systems, mission duration, crew activities, and payloads. From a microbiological perspective, preventative measures will remain the primary techniques to mitigate microbial risk. Thus, most of the effort will focus on stringent preflight monitoring requirements and engineering controls designed into the vehicle, such as HEPA air filters. Due to volume constraints in the CEV, in-flight monitoring will be limited for short-duration missions to the measurement of biocide concentration for water potability. Once long-duration habitation begins on the lunar surface, a more extensive environmental monitoring plan will be initiated. However, limited in-flight volume constraints and the inability to return samples to Earth will increase the need for crew capabilities in determining the nature of contamination problems and method of remediation. In addition, limited shelf life of current monitoring hardware consumables and limited capabilities to dispose of biohazardous trash will drive flight hardware toward non-culture based methodologies, such as hardware that rapidly distinguishes biotic versus abiotic surface contamination. As missions progress to Mars, environmental systems will depend heavily on regeneration of air and water and biological waste remediation and regeneration systems, increasing the need for environmental monitoring. Almost complete crew autonomy will be needed for assessment and remediation of contamination problems. Cabin capacity will be limited; thus, current methods of microbial monitoring will be inadequate. Future methodology must limit consumables, and these consumables must have a shelf life of over three years. In summary, missions to the moon and Mars will require a practical design that prudently uses available resources to mitigate microbial risk to the crew.
Author
Life Support Systems; Mars Missions; Payloads; Spacecrews; International Space Station; Microbiology; Environmental Monitoring

20060022171 NASA Ames Research Center, Moffett Field, CA, USA
Earth's Earliest Ecosystems in the C: The Use of Microbial Mats to Demonstrate General Principles of Scientific Inquiry and Microbial Ecology
Bebout, Brad M.; Bucaria, Robin; [2006]; 1 pp.; In English; AbSciCon 2006, 26 Mar. 2006, Washington, DC, USA
Contract(s)/Grant(s): 21-344-58-00; No Copyright; Avail.: Other Sources; Abstract Only

Microbial mats are living examples of the most ancient biological communities on Earth. As Earth's earliest ecosystems, they are centrally important to understanding the history of life on our planet and are useful models for the search for life elsewhere. As relatively compact (but complete) ecosystems, microbial mats are also extremely useful for educational activities. Mats may be used to demonstrate a wide variety of concepts in general and microbial ecology, including the biogeochemical cycling of elements, photosynthesis and respiration, and the origin of the Earth's present oxygen containing atmosphere. Microbial mats can be found in a number of common environments accessible to teachers, and laboratory microbial mats can be constructed using materials purchased from biological supply houses. With funding from NASA's Exobiology program, we have developed curriculum and web-based activities centered on the use of microbial mats as tools for demonstrating general principles in ecology, and the scientific process. Our web site (http://microbes.arc.nasa.gov) includes reference materials, lesson plans, and a 'Web Lab', featuring living mats maintained in a mini-aquarium. The site also provides information as to how research on microbial mats supports NASA's goals, and various NASA missions. A photo gallery contains images of mats, microscopic views of the organisms that form them, and our own research activities. An animated educational video on the web site uses computer graphic and video microscopy to take students on a journey into a microbial mat. These activities are targeted to a middle school audience and are aligned with the National Science Standards.
Author
Microorganisms; Ecology; Ecosystems; Photosynthesis; Microbiology; Exobiology; Biogeochemistry

20060022638 NASA, Washington, DC, USA
Mars Sample Handling Protocol Workshop Series: Workshop 4
Race Margaret S., Editor; DeVincenzi, Donald L., Editor; Rummel, John D., Editor; Acevedo, Sara E., Editor; [2001]; 1 pp.; In English; Workshop 4 Proceedings, 5-7 Jun. 2001, Arlington, VA, USA
Contract(s)/Grant(s): 896-50-02-01; Copyright; Avail.: Other Sources; Abstract Only

In preparation for missions to Mars that will involve the return of samples to Earth, it will be necessary to prepare for the receiving, handling, testing, distributing, and archiving of martian materials here on Earth. Previous groups and committees have studied selected aspects of sample return activities, but specific detailed protocols for the handling and testing of returned samples must still be developed. To further refine the requirements for sample hazard testing and to develop the criteria for subsequent release of sample materials from quarantine, the NASA Planetary Protection Officer convened a series of workshops in 2000-2001. The overall objective of the Workshop Series was to produce a Draft Protocol by which returned martian sample materials can be assessed for biological hazards and examined for evidence of life (extant or extinct) while safeguarding the purity of the samples from possible terrestrial contamination. This report also provides a record of the proceedings of Workshop 4, the final Workshop of the Series, which was held in Arlington, Virginia, June 5-7, 2001. During Workshop 4, the sub-groups were provided with a draft of the protocol compiled in May 2001 from the work done at prior Workshops in the Series. Then eight sub-groups were formed to discuss the following assigned topics: Review and Assess the Draft Protocol for Physical/Chemical Testing Review and Assess the Draft Protocol for Life Detection Testing Review and Assess the Draft Protocol for Biohazard Testing Environmental and Health/Monitoring and Safety Issues Requirements of the Draft Protocol for Facilities and Equipment Contingency Planning for Different Outcomes of the Draft Protocol Personnel Management Considerations in Implementation of the Draft Protocol Draft Protocol Implementation Process and Update Concepts This report provides the first complete presentation of the Draft Protocol for Mars Sample Handling to meet planetary protection needs. This Draft Protocol, which was compiled from deliberations and recommendations from earlier Workshops in the Series, represents a consensus that emerged from the discussions of all the sub-groups assembled over the course of the five Workshops of the Series. These discussions converged on a conceptual approach to sample handling, as well as on specific analytical requirements. Discussions also identified important issues requiring attention, as well as research and development needed for protocol implementation.
Author
Contamination; Mars Surface Samples; Mars Sample Return Missions; Specimens; Planetary Protection; Environment Protection; Sample Return Missions

20060022738 NASA Ames Research Center, Moffett Field, CA, USA
Astrobiology Extends Biology into Deep Time and Space
Desmarais, David; March 25, 2003; 1 pp.; In English
Contract(s)/Grant(s): RTOP 344-53-92-00-00; No Copyright; Avail.: Other Sources; Abstract Only

To understand our own origins and to search for biospheres beyond Earth, we need a more robust concept of life itself. We must learn how to discriminate between attributes that are fundamental to all living systems versus those that represent principally local outcomes of long-term survival on Earth. We should identify the most basic environmental needs of life, chart

the distribution of other habitable worlds, and understand the factors that created their distribution. Studies of microbial communities and the geologic record will be summarized that offer clues about the early evolution of our own biosphere as well as the signatures of life that we might find in the heavens.
Author
Biosphere; Exobiology; Microorganisms; Deep Space

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

20060021585 AI Solutions, Inc., Lanham, MD, USA
Accommodating Sensor Uncertainty in the Cones Method: Polycones and Fuzzycones
Hashmall, Joseph A.; [2006]; 3 pp.; In English; AAS/AIAA Astrodynamics Specialists Conference, 21-24 Aug. 2006, Keystone, CO, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

The 'cones method' is an analytical algorithm to combine a pair of angle observations into a common vector. Two new algorithms have been developed to optimize the 'cones method' solutions when more than two observation angles are available and when estimates of measurement uncertainties can be made. The polycones algorithm consists of determining a simple weighted average of the solution vectors over all possible pairs of measurements with the weights determined from the measurement uncertainty. The Fuzzycones method finds the vector of maximum probability. Both of these methods have been implemented and tested and both reduce errors in computed vector positions.
Author
Algorithms; Uncertain Systems; Probability Theory; Vectors (Mathematics)

20060021965 Tech-X Corp., Boulder, CO, USA
Final Report for CORBA for Fourth Generation Languages
Shasharina, S.; Jun. 28, 2005; 30 pp.; In English
Report No.(s): DE2006-841121; No Copyright; Avail.: Department of Energy Information Bridge

The standard for object based networking is the Common Object Request Broker Architecture (CORBA). However, CORBA is not available for Fourth Generation Languages (4GLs) such as Visual Numerics. PV-WAVE or Research Systems. Interactive Data Language (RSI-IDL), which are widely used by scientists and engineers for data visualization and analysis. The proposed work would provide a set of tools to allow 4GLs to interoperate with CORBA.
NTIS
Languages; Architecture (Computers); Object-Oriented Programming

20060021974 Sandia National Labs., Albuquerque, NM USA
Multi-scale Saliency Search in Image Analysis
Slepoy, A.; Backer, A.; Campisi, A.; Oct. 2005; 18 pp.; In English
Report No.(s): DE2006-875629; SAND2005-6057; No Copyright; Avail.: National Technical Information Service (NTIS)

Saliency detection in images is an important outstanding problem both in machine vision design and the understanding of human vision mechanisms. Recently, seminal work by Itti and Koch resulted in an effective saliency-detection algorithm. We reproduce the original algorithm in a software application Vision and explore its limitations. We propose extensions to the algorithm that promise to improve performance in the case of difficult-to-detect objects.
NTIS
Algorithms; Image Analysis

20060021976 Sandia National Labs., Albuquerque, NM USA
Red Storm Usage Model Version 1.12
Jefferson, K. L.; Sturtevant, J. E.; Dec. 2005; 68 pp.; In English
Report No.(s): DE2006-875632; SAND2005-6926; No Copyright; Avail.: Department of Energy Information Bridge

Red Storm is an Advanced Simulation and Computing (ASC) funded massively parallel supercomputer located at Sandia National Laboratories (SNL). The Red Storm Usage Model (RSUM) documents the capabilities and the environment provided for the FY05 Tri-Lab Level II Limited Availability Red Storm User Environment Milestone and the FY05 SNL Level II

Limited Availability Red Storm Platform Milestone. This document describes specific capabilities, tools, and procedures to support both local and remote users. The model is focused on the needs of the ASC user working in the secure computing environments at Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), and SNL. Additionally, the Red Storm Usage Model maps the provided capabilities to the Tri-Lab ASC Computing Environment (ACE) requirements. The ACE requirements reflect the high performance computing requirements for the ASC community and have been updated in FY05 to reflect the community's needs. For each section of the RSUM, Appendix I maps the ACE requirements to the Limited Availability User Environment capabilities and includes a description of ACE requirements met and those requirements that are not met in that particular section. The Red Storm Usage Model, along with the ACE mappings, has been issued and vetted throughout the Tri-Lab community.
NTIS
Parallel Computers; Storms; Massively Parallel Processors; Supercomputers

20060021984 Sandia National Labs., Albuquerque, NM USA
Validation of the Thermal Challenge Problem Using Bayesian Belief Networks
McFarland, J. M.; Swiler, L. P.; Nov. 2005; 30 pp.; In English
Report No.(s): DE2006-875636; SAND2005-5980; No Copyright; Avail.: Department of Energy Information Bridge

The thermal challenge problem has been developed at Sandia National Laboratories as a testbed for demonstrating various types of validation approaches and prediction methods. This report discusses one particular methodology to assess the validity of a computational model given experimental data. This methodology is based on Bayesian Belief Networks (BBNs) and can incorporate uncertainty in experimental measurements, in physical quantities, and model uncertainties. The approach uses the prior and posterior distributions of model output to compute a validation metric based on Bayesian hypothesis testing (a Bayes' factor). This report discusses various aspects of the BBN, specifically in the context of the thermal challenge problem. A BBN is developed for a given set of experimental data in a particular experimental configuration. The development of the BBN and the method for 'solving' the BBN to develop the posterior distribution of model output through Monte Carlo Markov Chain sampling is discussed in detail. The use of the BBN to compute a Bayes' factor is demonstrated.
NTIS
Belief Networks; Computer Programs

20060021988 Tennessee Univ., Knoxville, TN, USA, Maryland Univ., College Park, MD, USA, Wisconsin Univ., Madison, WI, USA
Cross-Platform Infrastructure for Scalable Runtime Application Performance Analysis. (Final Report.)
Dongarra, J.; Moore, S.; Hollingsworth, J.; Miller, B.; January 2005; 16 pp.; In English
Report No.(s): DE2006-841192; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this project was to build an extensible cross-platform infrastructure to facilitate the development of accurate and portable performance analysis tools for current and future high performance computing (HPC) architectures. Major accomplishments include tools and techniques for multidimensional performance analysis, as well as improved support for dynamic performance monitoring of multithreaded and multiprocess applications. Previous performance tool development has been limited by the burden of having to re-write a platform-dependent low-level substrate for each architecture/operating system pair in order to obtain the necessary performance data from the system. Manual interpretation of performance data is not scalable for large-scale long-running applications. The infrastructure developed by this project provides a foundation for building portable and scalable performance analysis tools, with the end goal being to provide application developers with the information they need to analyze, understand, and tune the performance of terascale applications on HPC architectures. The backend portion of the infrastructure provides runtime instrumentation capability and access to hardware performance counters, with thread-safety for shared memory environments and a communication substrate to support instrumentation of multiprocess and distributed programs.
NTIS
Reliability Analysis; Data Systems; Safety; Counters

20060022143 NASA Ames Research Center, Moffett Field, CA, USA
Explaining Verification Conditions
Deney, Ewen; Fischer, Bernd; [2006]; 16 pp.; In English; Formal Methods 2006, 21-27 Aug. 2006, Hamilton, Ontario, Canada; Copyright; Avail.: CASI: A03, Hardcopy

The Hoare approach to program verification relies on the construction and discharge of verification conditions (VCs) but

offers no support to trace, analyze, and understand the VCs themselves. We describe a systematic extension of the Hoare rules by labels so that the calculus itself can be used to build up explanations of the VCs. The labels are maintained through the different processing steps and rendered as natural language explanations. The explanations can easily be customized and can capture different aspects of the VCs; here, we focus on their structure and purpose. The approach is fully declarative and the generated explanations are based only on an analysis of the labels rather than directly on the logical meaning of the underlying VCs or their proofs. Keywords: program verification, Hoare calculus, traceability.
Author
Program Verification (Computers); Proving; Natural Language (Computers); Calculus

20060022713 Sandia National Labs., Albuquerque, NM USA
Role of Customized Computational Tools in Product Development
Tikare, V.; Heinstein, M.; Kempka, S.; January 2006; 22 pp.; In English
Report No.(s): DE2006-876313; SAND2005-2719; No Copyright; Avail.: Department of Energy Information Bridge

Model-based computer simulations have revolutionized product development in the last 10 to 15 years. Technologies that have existed for many decades or even centuries have been improved with the aid of computer simulations. Everything from low-tech consumer goods such as detergents, lubricants and light bulb filaments to the most advanced high-tech products such as airplane wings, wireless communication technologies and pharmaceuticals is engineered with the aid of computer simulations today. In this paper, we present a framework for describing computational tools and their application within the context of product engineering. We examine a few cases of product development that integrate numerical computer simulations into the development stage. We will discuss how the simulations were integrated into the development process, what features made the simulations useful, the level of knowledge and experience that was necessary to run meaningful simulations and other details of the process. Based on this discussion, recommendations for the incorporation of simulations and computational tools into product development will be made.
NTIS
Computer Aided Design; Computerized Simulation; Product Development

20060022715 Sandia National Labs., Albuquerque, NM USA
IFP V4.0: A Polar-Reformatting Image Formation Processor for Synthetic Aperture Radar
Eichel, P. H.; Sep. 2005; 40 pp.; In English
Report No.(s): DE2006-876242; SAND2005-5232; No Copyright; Avail.: Department of Energy Information Bridge

IFP V4.0 is the fourth generation of an extraordinarily powerful and flexible image formation processor for spotlight mode synthetic aperture radar. It has been successfully utilized in processing phase histories from numerous radars and has been instrumental in the development of many new capabilities for spotlight mode SAR. This document provides a brief history of the development of IFP, a full exposition of the signal processing steps involved, and a short users manual for the software implementing this latest iteration.
NTIS
Image Processing; Synthetic Aperture Radar

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

20060021579 Massachusetts Inst. of Tech., Cambridge, MA USA
Quantum Information Technology: Entanglement, Teleportation, and Memory
Shapiro, Jeffrey H; Oct 31, 2005; 53 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0177
Report No.(s): AD-A447271; No Copyright; Avail.: CASI: A04, Hardcopy

A team of researchers from the Massachusetts Institute of Technology and Northwestern University worked to develop the technology elements needed to perform long-distance, high-fidelity qubit teleportation. In particular: this team developed novel sources of polarization-entangled photons based on chi-2 and chi-3 materials; it developed devices for high-efficiency quantum state frequency conversion and demonstrated long-distance entanglement distribution via optical fiber; and it worked toward realizing quantum memory elements in both trapped-atom and atomic-ensemble systems. The experimental work was

supported by a variety of theoretical studies. Other theoretical work addressed more general issues in quantum communication and entanglement applications.
DTIC
Quantum Theory; Memory (Computers); Computer Storage Devices; Frequency Converters

20060021701 Colorado Univ., Boulder, CO USA
The Software Dock: A Distributed, Agent-based Software Deployment System
Hall, Richard S; Heimberger, Dennis; van der Hoek, Andre; Wolf, Alexander L; May 1997; 22 pp.; In English
Contract(s)/Grant(s): N66001-95-D-8656; F30602-94-C-0253
Report No.(s): AD-A447765; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447765; Avail.: CASI: A03, Hard-copy

Few tools exist to address the post-development activities of configuring, releasing, installing, updating, reconfiguring and even de-installing a software system. Certainly there is no unified approach for all of these activities, and none that can take full advantage of a wide-area network. The Software Dock represents an architecture for supporting post-development activities in such a setting. It is designed as a system of loosely-coupled, cooperating, distributed components that are bound together by a wide-area messaging and event system. The components include field docks for maintaining site-specific configuration information by consumers, release docks for maintaining site-specific configuration and release of software systems by producers, and a variety of agents for automating the activities. Its mechanisms of consistent access to a site's configuration information and resources, standardized methods for making software releases available and visible, and a global event system give software producers and consumers new leverage in managing complex software systems. In this paper we describe the Software Dock architecture and discuss the use of a prototype implementation of that architecture in deploying a complex system.
DTIC
Deployment; Wide Area Networks

20060021867 Maryland Univ., College Park, MD USA
Trust Networks on the Semantic Web
Golbeck, Jennifer; Parisa, Bijan; Hendler, James; Jan 2006; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447994; No Copyright; Avail.: CASI: A03, Hardcopy

The so-called 'Web of Trust' is one of the ultimate goals of the Semantic Web. Research on the topic of trust in this domain has focused largely on digital signatures, certificates, and authentication. At the same time, there is a wealth of research into trust and social networks in the physical world. In this paper, we describe an approach for integrating the two to build a web of trust in a more social respect. This paper describes the applicability of social network analysis to the semantic web, particularly discussing the multi-dimensional networks that evolve from ontological trust specifications. As a demonstration of algorithms used to infer trust relationships, we present several tools that allow users to take advantage of trust metrics that use the network.
DTIC
Internets; Semantics

20060021881 Raytheon Missile Systems Co., Tucson, AZ USA
Integrated Sensing and Processing (ISP) Phase II: Demonstration and Evaluation for Distributed Sensor Networks and Missile Seeker Systems
Schmitt, Harry A; Waagen, Donald E; Bellofiore, Sal; Stevens, Thomas; Cramer, Robert; Savage, Craig; Shah, Nitesh; Daniels, William; May 31, 2006; 50 pp.; In English
Contract(s)/Grant(s): N00014-04-C-0437
Report No.(s): AD-A448031; No Copyright; Avail.: CASI: A03, Hardcopy

The primary goal of this effort is to bring to maturity a select set of basic algorithms, hardware, and approaches developed under the Integrated Sensing and Processing (ISP) Phase I program, implement them on representative hardware, and demonstrate their performance in a realistic field environment. We have identified a few promising research thrusts investigated in ISP Phase I where field demonstrations are cost prohibitive but collected data sets are available. Here, we will conduct a thorough performance evaluation.
DTIC
Computer Networks; Detection; Detectors; Homing Devices; Missile Systems; Missile Tracking; Systems Integration

20060021886 Maryland Univ., College Park, MD USA
Modeling of Block-Based DSP Systems
Ko, Dong-Ik; Bhattacharyya, Shuvra S; Jan 2006; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): MDA972-00-1-0023; NSF-0325119
Report No.(s): AD-A448041; No Copyright; Avail.: CASI: A03, Hardcopy

Modeling semantics based on dataflow graphs are used widely in design tools for digital signal processing (DSP). This paper develops efficient techniques for representing and manipulating block-based operations in dataflow-based DSP design tools. In this context, a block refers to a finite-length sequence of data items, such as a sequence of speech samples, an image, or a group of video frames, as part of an enclosing data stream. We develop in this paper a meta-modeling technique called blocked dataflow (BLDF) for augmenting DSP design tools with more effective blocked data support in an efficient and general manner. We compare BLDF against alternative modeling approaches through a detailed case study of an MPEG 2 video encoder system.
DTIC
Digital Systems; Semantics; Signal Processing

20060022155 NASA Ames Research Center, Moffett Field, CA, USA
Columbia Application Performance Tuning Case Studies
Chang, Johnny; [2006]; 1 pp.; In English; Gelato Itanium Conference and Expo, 23-26 Apr. 2006, San Jose, CA, USA
Contract(s)/Grant(s): NNA05AC20T; No Copyright; Avail.: Other Sources; Abstract Only

This talk will. present several case studies of application performance enhancements on the SGI Altix platform. The enhancements include both explicit (dplace) and implicit (cpubind/cpuset-pin) process-pinning, eliminating memory contention in OpenMP applications, eliminating unaligned memory accesses, and system profiling. These enhancements enabled 2- to 28-fold improvements in application performance.
Author
Augmentation; Supercomputers; Architecture (Computers)

20060022688 NASA Ames Research Center, Moffett Field, CA, USA
Petascale Computing: Impact on Future NASA Missions
Brooks, Walter; [2006]; 26 pp.; In English; Distributed European Infrastructure for Supercomputing Application Symposium, 4-5 May 2006, Bologna, Italy; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hard-copy

This slide presentation reviews NASA's use of a new super computer, called Columbia, capable of operating at 62 Tera Flops. This computer is the 4th fastest computer in the world. This computer will serve all mission directorates. The applications that it would serve are: aerospace analysis and design, propulsion subsystem analysis, climate modeling, hurricane prediction and astrophysics and cosmology.
CASI
NASA Programs; Supercomputers; Applications Programs (Computers)

61
COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20060021571 Virginia Univ., Charlottesville, VA USA
Capacity and Capability Computing using Legion
Natrajan, Anand; Humphrey, Marty; Grimshaw, Andrew; Jan 2006; 11 pp.; In English
Contract(s)/Grant(s): DAHC94-96-C-0008; NSF EIA-99-74968
Report No.(s): AD-A447012; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447012; Avail.: CASI: A03, Hard-copy

Computational Scientists often cannot easily access the large amounts of resources their applications require. Legion is a collection of software services that facilitate the secure and easy use of local and non-local resources by providing the illusion of a single virtual machine from heterogeneous, geographically-distributed resources. This paper describes the newest

additions to Legion that enable high-performance (capacity) computing as well as secure, fault-tolerant and collaborative (capability) computing.
DTIC
Computers; Fault Tolerance; Computational Grids

20060021572 Virginia Univ., Charlottesville, VA USA
The Legion Support for Advanced Parameter-Space Studies on a Grid
Natrajan, Anand; Humphrey, Marty A; Grimshaw, Andrew S; Jan 2006; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAHC94-96-C-0008; NSF EIA-99-74968
Report No.(s): AD-A447045; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447045; Avail.: CASI: A03, Hard-copy

Parameter-space studies involve running a single application several times with different parameter sets. Since the jobs are mutually independent, many computing resources can be recruited to conduct an entire study in a distributed manner. Parameter-space studies are attractive applications for grids, which are networked collections of computing and other resources. Legion is a grid infrastructure that facilitates the secure and easy use of heterogeneous, geographically-distributed resources by providing the illusion of a single virtual machine from those resources. Legion provides tools and services that support advanced parameter-space studies, i.e., studies that make complex demands such as transparent access to distributed files, fault-tolerance and security. We demonstrate these benefits with a protein-folding experiment in which a molecular simulation package was run over a grid managed by Legion.
DTIC
Computer Networks; Computational Grids; Parallel Processing (Computers); Interprocessor Communication

20060021574 Belgrade Univ., Macedonia
Extended Limits of WIPL-D on PCs
Sumic, Drazen S; Kolundzija, Branko M; Jan 2005; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447500; No Copyright; Avail.: CASI: A01, Hardcopy

In the process of electromagnetic modeling and simulation, one encounters various limits imposed by the hardware capabilities of modern computers. As the complexity or the electrical size of the problem grows, so does the need for faster processors and more RAM in order to make the analysis of such projects feasible. With the era of 64 bit computing at our door step, 4GB is no longer the theoretical maximum addressable memory space on PC computers, which allows the analysis of demanding electromagnetic problems on every desktop. In this paper, several tests have been presented regarding the analysis of a cube of dimensions up to 30 wavelength(lambda) x 30 wavelength(lambda) x 30 wavelength(lambda). Significant advancements in modeling and analysis of electrically large structures in WIPL-D Pro code are the main focus. Tests include: running WIPL-D Pro code in the Windows and Linux 64-bit environments, employing 2 processors in parallel and speed comparisons between the latest and previous versions of the code.
DTIC
Mathematical Models; Airborne/Spaceborne Computers; Structural Analysis

20060021636 QinetiQ Ltd., Malvern, UK
Information Exchange Between Resilient and High-Threat Networks: Techniques for Threat Mitigation
Dean, Tim; Wyatt, Graham; Nov 1, 2004; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447418; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447418; Avail.: Defense Technical Information Center (DTIC)

No abstract available
Computer Information Security; Computer Networks

20060021637 Philadelphia Naval Shipyard, PA USA
The National Shipbuilding Research Program. 1988 Ship Production Symposium, Paper No. 2B: An Integrated CAD/CAM Network for Work Packaging Development and Database Management
O'Hare, M S; Anderson, M J; Aug 1988; 24 pp.; In English
Report No.(s): AD-A447520; NSRP-0298; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447520; Avail.: Defense Technical Information Center (DTIC)

The Zone Logic Technology CAD/CAM and networked Database Management System is an integrated system of commercially available, off-the-shelf computer hardware and software products. These products have been carefully selected, tailored, and integrated to specifically satisfy and support the Philadelphia Naval Shipyard (PNSY) Zone Technology Program in support of work packaging development, computer aided graphics and an on line, real-time, distributive database management system. The process used publishing this paper serves as a small example of some of the capabilities of the system at PNSY. The entire document, including graphics, was generated on the system. Scanners, CAD and PC systems were utilized to input, develop and convert the graphics files into appropriate formats for import into a technical publications software package. LAN interconnection capabilities provided option developing portions of this document on different systems and at different locations with the ability IO access the appropriate files remotely. Philadelphia Naval Shipyard has thrust itself into the 21st century in both new management and automated technologies. Senior managers arc making bold business decisions necessary to the shipyard shipyard's survival. A pilot project has been initiated to develop and execute a transition phase to improve shipyard productivity. Major changes to management, workpackaging, production, planning, and design execution are currently ongoing Computer assistance has been developed and is being coupled with these changes, thus forming a Zone Logic Technology (ZLT) Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) and networked Data Base Management System (DBMS).
DTIC
Computer Aided Design; Computer Aided Manufacturing; Conferences; Data Base Management Systems; Data Management; Marine Technology; Packaging; Productivity; Ships

20060021645 Colorado Univ., Boulder, CO USA
Multiple Representation Perspectives for Supporting Explanation in Context
Rathke, Christian; Redmiles, David F; Mar 1993; 22 pp.; In English
Contract(s)/Grant(s): MDA903-86-C0143
Report No.(s): AD-A447671; CU-CS-645-93; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447671; Avail.: CASI: A03, Hardcopy

The term perspective is used for a set of properties describing an object with respect to a common theme. The use of a perspectives representation is illustrated and evaluated in a programming tool called EXPLAINER, which supports programmers by providing explanations of examples related to the programmers' current task. Having multiple representation perspectives is essential for supporting people working from examples. Namely, it allows explanations of the examples to be generated according to perspectives that accommodate the changing context and needs of the programmers while they explore an example and develop a solution to their task. The multiple representation perspectives and corresponding perspective explanations support the development of a mental model of the example that can then be used in solving the current task. A formal notion of perspectives as named%d sets of property-value pairs is incorporated in FrameTalk, a frame-based knowledge representation language. It is used to illustrate the representational basis for examples as they occur in the EXPLAINER system. The perspectives mechanism also addresses problems found in term-based knowledge representation languages, problems such as the proliferation of nonintuitive concepts, the misuse of the generalization link as a compositional link, and the differences when using concepts in different application contexts.
DTIC
Computer Programming; Mental Performance; Programmers

20060021647 Virginia Univ., Charlottesville, VA USA
Amortizing 3D Graphics Optimization Across Multiple Frames
Durbin, Jim; Gossweiler, Rich; Pausch, Randy; Nov 1995; 8 pp.; In English
Report No.(s): AD-A447678; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447678; Avail.: CASI: A02, Hard-copy

This paper describes a mechanism for improving rendering rates dynamically during runtime in an interactive three-dimensional graphics application. Well-known techniques such as transforming hierarchical geometry into a flat list and removing redundant graphics primitives are often performed off-line on static databases, or continuously every rendering frame. In addition, these optimizations are usually performed over the whole database. We observe that much of the database remains static for a fixed period of time, while other portions are modified continuously (e.g. the camera position), or are repeatedly modified during some finite interval (e.g. during user interaction). We have implemented a runtime optimization mechanism which is sensitive to repeated, local database changes. This mechanism employs timing strategies which optimize only when the cost of optimization will be amortized over a sufficient number of frames. Using this optimization scheme, we observe a rendering speedup of roughly 2.5 in existing applications. We discuss our initial implementation of this mechanism,

the improved timing measurements, the issues and assumptions we made, and future improvements.
DTIC
Computer Graphics; Optimization

20060021653 A and P Appledore International, UK
The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 10: SPCS -- A Comprehensive System for Shipyard Production Control (The National Shipbuilding Research Program)
Vaughn, Roger; Smith, Ronald; Jun 1977; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447687; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447687; Avail.: CASI: A03, Hard-copy

With shipbuilding capacity worldwide well in excess of demand and competition for orders extremely fierce, shipyards must ensure that all resources are used effectively. Each man on the shop floor, each foreman and manager must be able to carry out the work required of him - which means that he must be provided with all the required information on the work to be done and the means to carry it out. The competition for orders, quite apart from resulting in shorter lead times, has resulted in shipyards building a wider range of products than was envisaged even a short time ago. The potential. variety of individual operations within a shipyard in this situation is much higher than in the case of a single product facility. The information channels used in this production system are similarly going to require greater capacity, speed and accuracy. SPCS is a flexible and uncomplicated approach to production control, aiming to supplement management rather than to replace management decision making by black-box decision rules. It consists of a set of inter-tied modules, each of which is executed either manually or by batch computer processing or on-line, depending on local circumstances.
DTIC
Conferences; Marine Technology; Production Management; Ships; Shipyards; Software Development Tools

20060021654 Litton Industries, Pascagoula, MS USA
The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 9: The Ingalls Production Planning and Control System
Davidson, James F; Jun 1977; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447688; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447688; Avail.: CASI: A03, Hard-copy

Ingalls' Production Planning and Control System assists in planning, scheduling, budgeting and tracking each work authorization developed to support the construction of each ship. The system is comprised of modules that have specific functions within the System and some of the modules interface with other modules. At the nucleus of Ingalls Production Planning and Control System is the Consolidated Data Base which provides all data that is required for the other modules.
DTIC
Conferences; Marine Technology; Production Planning; Ships; Shipyards; Software Development Tools

20060021655 Avondale Shipyards, Inc., New Orleans, LA USA
The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 7: Considerations for an Automated Pipe Fabrication Facility
Gatlin, Ollie H; Jun 1977; 16 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447689; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447689; Avail.: CASI: A03, Hard-copy

Fabrication cost of ship piping systems is of a magnitude worthy of study, since it is roughly equal to one-fourth of the total hull cost of a ship. The primary objective of our study is to design a cost effective and automatic handling, method of fabricating pipe which will reduce the labor, material storage space and required fabrication area. We have concluded that automatic, pipe fabricating there is not a single total automatic, or semisystem available in the world today. Yet, most of the machines required for such systems are available in Europe, Japan, and the USA. We envision the use of a mini-computer, supported by a primary computer, which could utilize a digitizer or some other method to design, update and revise the various parts of the system.
DTIC
Conferences; Fabrication; Marine Technology; Pipes (Tubes); Ships

20060021656 Mitsui Engineering and Shipbuilding Co. Ltd., Tokyo, Japan

The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 6: Hierarchical Application of Computers for an Automated Pipe Shop

Aya, Hirohiko; Jun 1977; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447690; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447690; Avail.: CASI: A03, Hard-copy

As computer technology advances, the cost of automation is reduced. Computerization of the piping job is one of the most important problems to be overcome in modernizing a shipyard. To solve this problem, Mitsui Engineering and Shipbuilding Company (MES) developed and implemented the semi-automated pipe fabricating shop system ('MAPS') at the Chiba Shipyard in 1972. 'MAPS' consists of two subsystems. One furnishes the full numerical information required for fabrication of various kinds of pipes in the pipe shops. The other is an automated pipe fabricating system operated by numerical information cards, which does not require any experience or judgement by pipe workers.

DTIC

Computer Aided Manufacturing; Computer Techniques; Conferences; Marine Technology; Pipes (Tubes); Ships; Software Development Tools

20060021657 Newport News Shipbuilding and Drydock Co., VA USA

The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 5: User Requirements for the Newport News Interactive Pipe Design System (RAPID)

Kelly, Patrick J; Rourke, Patrick W; Jun 1977; 16 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447691; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447691; Avail.: CASI: A03, Hard-copy

The purpose of the inteRActive PIpe Design (RAPID) project is to develop a low cost system for the capture and error checking of ship piping design in order to produce manufacturing documents for the piping shop. The system is based around a mini-computer and several design stations. Each design station consists of a large digitizing table and a graphic display screen. The designer will scheme pipe in the conventional manner, then digitize the pipe geometry stored in the minicomputer. From here extensive error checking can be evoked using the computer data base. Line drawings can then be produced with instructions and material lists.

DTIC

Computer Aided Design; Conferences; Marine Technology; Pipes (Tubes); Ships; User Requirements

20060021658 Computervision Corp., Bedford, MA USA

The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 4: Computer-Aided Engineering and Drafting in Shipbuilding

Cowan, Robert A; Jun 1977; 33 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447692; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447692; Avail.: CASI: A03, Hard-copy

Presentation gives an overview of uses and advantages of computer aided design.

DTIC

Computer Aided Design; Conferences; Drafting (Drawing); Marine Technology; Ships

20060021660 Giannotti and Associates, Inc., Berkeley, CA USA

The National Shipbuilding Research Program. Proceedings of the IREAPS Technical Symposium. Paper No. 27: Application of SHIPOPT to Preliminary Design of Commercial Ships, Volume 1

Moore, Colin S; Maris, Allan T; Sep 1982; 19 pp.; In English

Report No.(s): AD-A447699; NSRP-0009; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447699; Avail.: CASI: A03, Hardcopy

The theory and results of applying computer-aided ship structure optimization procedures to design of a new ferry for southwestern Alaska routes is presented, and is called SHIPOPT. It has been developed by Professor Owen Hughes of the University of New South Wales, Australia, and has had recent application by Giannotti and Associates Inc, to structural design of U.S. Navy ships. Ship optimization is a rationally based, interactive procedure which recognizes prescribed design constraints and optimizes within those constraints ship structural scantlings and geometry for strength, weight, and cost. The structural constraints typically considered are allowable shear and bending stresses, buckling loads, fatigue life, weight, and

ship arrangements, based on commercial or regulatory body requirements.
DTIC
Computer Aided Design; Conferences; Marine Technology; Ships

20060021694 Colorado Univ., Boulder, CO USA
A General Property Storage Module
Waite, William M; Kadhim, Basim M; Sep 1995; 17 pp.; In English
Contract(s)/Grant(s): DAAL03-92-G-0158
Report No.(s): AD-A447758; CU-CS-786-95; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447758; Avail.: CASI: A03, Hardcopy

This paper describes a C module that provides a unique representation for arbitrary number of entities, and allows an arbitrary set of properties of arbitrary types to be associated with each entity. Entities can be pre-defined as well as created as the program runs; property values for pre-defined entities can be established at load time. The module exports a useful set of property query and update routines, and this set is easily extended by the user. A property storage module for a specific application can be instantiated from a simple specification describing the requirements imposed by that application. This approach eases the task of the person designing the application, and allows them to strongly separate the property storage aspects of solutions to different subproblems.
DTIC
Computer Techniques; Modules; Object-Oriented Programming

20060021704 Naval Surface Warfare Center, Bethesda, MD USA
The National Shipbuilding Research Program, Proceedings of the IREAPS Technical Symposium Paper Number 1: Ship Production Committee Panel Overviews
Sep 1981; 89 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447768; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447768; Avail.: CASI: A05, Hardcopy

The Institute for Research and Engineering for Automation and Productivity in Shipbuilding (IREAPS) is an organization which conducts an industry/government cooperative program for enhancing U.S. shipbuilding capabilities through development and implementation of improved systems and manufacturing technology. The primary thrust of the IREAPS program is the conduct of research and development projects for a variety of design and production processes in the shipyard. Such projects are initiated and pursued only upon consensus of the participating organizations and are not considered complete or successful until they have been implemented under actual shipyard production conditions.
DTIC
Conferences; Marine Technology; Ships

20060021706 Spectra Research Systems, Inc., Falls Church, VA USA
The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 25: Computer Graphics Hardware and Application in Shipbuilding
Eng, O; Jun 1976; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447774; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447774; Avail.: CASI: A03, Hardcopy

The computer graphics technology is now developed far enough to be applicable in CAD systems for use in the shipbuilding industry. Computer graphics implies on-line access to the computer system, and will give the users a more direct contact with the computer assisted design process. Graphical presentation of the contents of the database will make the database more user-oriented.
DTIC
Computer Graphics; Conferences; Marine Technology; Ships

20060021708 IIT Research Inst., Chicago, IL USA
The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 24: ALKON from Lay-Out to Production on the Example of a Double Bottom
Boiisard, J P; Jun 1976; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447776; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447776; Avail.: CASI: A03, Hardcopy

The 'Double-Bottom' is one specific part of the ship structure for which one can easily imagine that an ALKON norm (or set of norms) can be applied. This paper presents an application those norms to a double bottom in both the engine room and cargo area.
DTIC
Computer Aided Design; Conferences; Marine Technology; Ship Hulls; Ships

20060021709 IIT Research Inst., Chicago, IL USA
The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 23: User's Guide to Norm Packages
Jun 1976; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447777; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447777; Avail.: CASI: A03, Hard-copy

The objective of the Autokon system may shortly be said to be to enable the user to describe in large detail the entire steel structure of a ship or other structure in the database, and extract a variety of design and production data. It should in other words be a 'drawing generator' (including information for NC-cutting) but also produce material lists, weight calculations, etc. To fulfill these tasks the present system of routines called norms play an important role. The basis of the present system of norms rests with ALKON, a problem oriented computer language. ALKON maintains a dialog with the Autokon database. It has very extensive features for describing plane geometry. . It is general in nature and may be used to store various types of information on the database. Various data structures may be defined by the user. An ALKON manuscript may be stored temporarily (REP) or permanently (NORM) on the database. This User's Guide will try to explain the philosophy and also give some practical examples in the use of the system. It also gives some basic information which the user needs in order to understand the tool he is using.
DTIC
Computer Aided Design; Conferences; Marine Technology; Ships

20060021710 IIT Research Inst., Chicago, IL USA
The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 22: Hull System at Italcantieri Company
Jun 1976; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447778; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447778; Avail.: CASI: A03, Hard-copy

To complement the functions which are not furnished by AUTOKONv1, the Italcantieri Company has developed a system, named SCAFO, that solves all the problems related to the shell structures and some related to the internal panelling. It includes the following modules: Frame Table definition, Primary Inner Structures Loading (panels), Shell Landing, Primary I Structures Landing, Section Drawing, Table of Detail (interface SCAFO - Al), Body and Shell Expansion Plan drawing, Shell Expansion, Templates. Long Frame and Transverse Frame expansion (interface SCAFO - Al), Jigs, block marking and controlling data, Bevels offset, Painting Lines Heights, Draft Marks and a General Base List. In addition to the above principal modules, other programs are available; they give us offset tables for frames, decks, longitudinals and other structures. This system and a large library of A. 1 norms gave us the opportunity of merging shipyard and headquaters divisions.
DTIC
Computer Aided Design; Conferences; Hulls (Structures); Marine Technology; Ships

20060021711 Applied Research Associates, Inc., Alexandria, VA USA
The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 20: A Report on the 1976 AUTOKON Users Club Meeting
Saetersdal, Haakon; Jun 1976; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447779; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447779; Avail.: CASI: A02, Hard-copy

The purpose of the AUTOKON User Club is to give all the users of the AUTOKON system a forum where they could discuss common problems, exchange information and present papers on AUTOKON-related subjects. Annual meetings have been held in different places in Europe. This year s meeting was arranged on May 11 and 12 in Bandol, a very nice little French

town 80 miles from Marseille, hosted by the yard Chantiers Navals De La Ciotat which presented a perfect arrangement. About 50 participants from 13 yards and SRS were present.
DTIC
Computer Aided Design; Conferences; Marine Technology; Ships

20060021712 Avondale Shipyards, Inc., New Orleans, LA USA
The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 18: Organizing for Numerical Control Production
Nuzzo, Vincent H; Jun 1976; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447781; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447781; Avail.: CASI: A03, Hard-copy

What is the optimum organizational pattern in a shipyard for application of Numerical Control (NC)? A precise answer to this question does not exist. Many things influence a shipyard s operation: management attitudes, personnel availability, finances, and geographical limitations are but a few. Without consideration for any of these factors, a good NC structure for a shipyard should be as follows: A computer applications section to develop or procure the software necessary for a good NC program; A fairing group, established in a department, that has the ability to manually fair a ship, and the adaptability to learn computer fairing; A scientific section that uses the data base for hull calculation programs, and provides the basic information needed for fairing and hulload; A hull engineering department, producing accurate drawings by utilizing the data base for drafting purposes, and supplying detailed information for fairing and hulload; A hulload group initial loading comprised of engineering and NC loft people -- of the data base should be done by hull engineering, with the NC loft, taking responsibility for the maintenance of hulload when part generation begins; and An NC mold, under production management, whose duties include part generation and nesting programming, as well as data base control -- this group should have access to whatever equipment is necessary to accomplish their duties. A review of the NC operations of several successful shipyards will be an effective method of determining a suitable NC system. Such a study will enable management to decide what hardware, software, and organizational pattern would best suit their needs.
DTIC
Computer Aided Manufacturing; Conferences; Marine Technology; Numerical Control; Ships

20060021713 National Steel and Shipbuilding Co., San Diego, CA USA
The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 17: NASSCO Organization for the SPADES System
Uberti, George A; Wasserboehr, Jack; Jun 1976; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447783; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447783; Avail.: CASI: A03, Hard-copy

As the National Steel and Shipbuilding Company (NASSCO) set out to use SPADES, an internal company organization for its use emerged, resulting in an effective working relationship among the various departments of the company. These departments are Engineering, Production, and Computer Services. The NASSCO organization for SPADES evolved along regular functional lines within the departments affected. Loftsmen, who used to make full size wooden templates on the mold loft floor, are now the Numerical Control (N/C) programmers who cause the N/C tapes to be made. Engineers, who issue preliminary unfaired ships lines, are now able to complete the job, since the fairing operation does not require a drafting board the size of the mold loft floor. Computer service personnel, who run the company computer, have added SPADES to the services they provide. And finally, the responsibility for control of the SPADES system is assigned to the Computer Support Group in the Engineering Department, which has charge of all scientific and engineering programs used by the Engineering Department. The user functions are divided between engineering and production. There are eight SPADES modules, three of which are used by the Engineering Department, three used by the Mold Loft, and two used jointly or by either as needed. The three engineering modules are: the Fairing and Drawing module; the Hulload module; and the Hullcal module, which is a package of naval architecture routines. The three modules used by the Mold Loft are: Part Generation module, which produces information and a tape for drawing the part; Nesting module, which produces a tape of nested parts for the burning machine; and Plate Development module, which produces tapes for burning shell plates. The Manufacturing Aids module is used jointly by Production and Engineering. Another joint-use module is the Utility module. This is a group of five programs used for direct access to the data base.
DTIC
Computer Aided Manufacturing; Conferences; Marine Technology; Ships

20060021715 National Bureau of Standards, Gaithersburg, MD USA

The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 13: Automation and Productivity in Discrete Part Manufacturing

Evans, Jr, John M; Jun 1976; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447785; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447785; Avail.: CASI: A03, Hard-copy

The subject of this conference is automation and productivity in shipbuilding. I am going to talk about automation and productivity in the general context of discrete part batch manufacturing, which includes shipbuilding, to try to provide a wider prospective on the technical strategies that are being used in applying automation in manufacturing, their impact on productivity enhancement, and the wider economic implications of enhancing productivity.

DTIC

Computer Aided Manufacturing; Conferences; Manufacturing; Marine Technology; Productivity; Ships

20060021716 Port Weller Dry Docks Ltd., Saint Catharines, Ontario Canada

The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 11: AUTOKON at a Small Yard

Harkey, Jesse; Jun 1976; 16 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447787; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447787; Avail.: CASI: A03, Hard-copy

There are two general subjects that will be covered in this paper - justification of a computerized mould loft for the small shipyard and implementation. The justification will be brief and figures represented in this portion are not actual figures obtained from Port Weller records, but are superficial numbers used only to give the basic ideas of how the eventual purchase of the Autokon system was justified at Port Weller Dry Docks. The implementation portion will be an actual account of our use of numerical control programming starting from December 1973, when the part and nest programs were first obtained from Shipping Research Services.

DTIC

Computer Aided Manufacturing; Conferences; Marine Technology; Ships

20060021717 CADCOM, Inc., Annapolis, MD USA

The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 10: Implementing the U.S. Navy's Hull Definition Program in U.S. Shipyards

Gebhardt, John C; Jun 1976; 22 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447788; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447788; Avail.: CASI: A03, Hard-copy

The unified Hull Definition System was designed by the U. S. Navy so that the digital computer could be used to assist in the fairing process. CADCOM, Inc. was tasked by MARAD and the Navy with transferring this technology to the U. S. shipbuilding industry. This transfer involves four steps: (1) enhancing the program to make it meet the needs of the industry, (2) generating four standard versions of the program, (3) creating documentation, and (4) conducting training seminars for potential users. The program does not replace the conventional methods of designing hull forms; rather, it functions as an interactive tool which allows the designer to retain control over the surface he is defining. He still performs his traditional procedures, but he performs them more quickly and accurately than before.

DTIC

Computer Aided Design; Conferences; Hulls (Structures); Marine Technology; Ships; Shipyards

20060021718 Cali and Associates, Inc., New Orleans, LA USA

The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 9: SPADE Interactive Graphics at Avondale

Cali, Filippo; Jun 1976; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447789; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447789; Avail.: CASI: A02, Hard-copy

When the decision was made to proceed with the development of the Interactive Graphics version of the SPADES System, a list of requirements and goals was made. One of the major considerations was to have total interchangeability between the graphic and the batch mode of the System such that rework could be processed easily, whether the original work had been

done through the 'CRT' or in batch. As much as we would like to think otherwise, experience has taught us that changes and revisions are an ever present way of life during the ship design and construction process. The requirement was also set that none of the SPADES management and control features would be compromised because of the graphic. In order for the graphic version to be a useful production tool, the user would have the capability of totally checking parts and/or burning tapes generated through the CRT without having to wait for a drafting machine drawing and/or computer printout. It was also decided that the user would have the capability of switching from one program to another directly from the tube without re-initializing any program at the central computer. The plans called for four CRTs to be on simultaneously, and for at least one batch SPADES program to be also running at the same time. This requirement caused the only major modification of the then existing SPADES System in order to allow different programs to read and write records from the same data base at the same time. By combining the use of virtual memory capability of the computer and judicious use of overlay, all the applicable programs have been linked together in one executable module.
DTIC
Computer Aided Manufacturing; Computer Graphics; Conferences; Marine Technology; Ships

20060021719 New Orleans Univ., LA USA
The National Shipbuilding Research Program. 1997 Ship Production Symposium, Paper Number 28: A Prototype Object-Oriented CAD System for Shipbuilding
Whitley, Norman L; Apr 1997; 12 pp.; In English
Report No.(s): AD-A447808; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447808; Avail.: CASI: A03, Hard-copy

This paper reports on the on-going development of an object-oriented CAD system at the Advanced Computer Laboratory for Shipbuilding at the University of New Orleans. It describes: the reasons for object-oriented (yard specific) development; the computer-aided software development environment; the developing class structure of the ship structures design application; and the planned developments within the CAD system and integration of packages to support visualization, planning and enterprise management and electronic data interchange.
DTIC
Computer Aided Design; Conferences; Marine Technology; Object-Oriented Programming; Prototypes; Ships

20060021721 University of Southern California, Los Angeles, CA USA
Software Architecture for Computer Vision: Beyond Pipes and Filters
Francois, Alexandre R; Jul 2003; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): EEC-9529152; MDA-908-00-C-0036
Report No.(s): AD-A447811; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447811; Avail.: CASI: A03, Hard-copy

This document highlights and addresses architecture level software development issues facing researchers and practitioners in the field of Computer Vision. A new framework, or architectural style, called SAI, is introduced. It provides a formalism for the design, implementation and analysis of software systems that perform distributed parallel processing of generic data streams. Architectural patterns are illustrated with a number of demonstration projects ranging from single stream automatic real-time video processing to fully integrated distributed interactive systems mixing live video, graphics and sound. SAI is supported by an open source architectural middleware called MFSM.
DTIC
Architecture (Computers); Computer Programs; Computer Systems Programs; Computer Vision; Distributed Processing; Pipes (Tubes)

20060021722 Proteus Engineering, Stevensville, MD USA
The National Shipbuilding Research Program. 1997 Ship Production Symposium, Paper Number 24: CAD/CAM/CIM Requirements for a World Class Commercial Shipyard
Ross, Jonathan M; Apr 1997; 16 pp.; In English
Report No.(s): AD-A447813; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447813; Avail.: CASI: A03, Hard-copy

With their ongoing reentry into the international shipbuilding market, U.S. shipyards are focusing on the strengths and potential of computer-aided design/computer-aided manufacturing/computer-integrated manufacturing, or CAD/CAM/CIM. World-class commercial shipyards and software suppliers in Europe and Japan have advanced the state of the art of

CAD/CAM/CIM and offer much for U.S. yards to learn. Indeed, they have proven generous in sharing their knowledge with the U.S., as evidenced during the conduct of the recent National Shipbuilding Research Program 'Evaluate the Shipbuilding CAD/CAM Systems' Project. The primary goal of Phase I of the Project was to identify key features of CAD/CAM/CIM implementations at world-class shipyards that most significantly contribute to the success of those shipyards in commercial shipbuilding and deliver this information to U.S. shipyards. That goal has been accomplished and the results presented at a CAD/CAM/CIM workshop at the 1996 Ship Production Symposium. This paper reports on Phase II of the CAD/CAM/CIM project, which built upon the knowledge gained in Phase I. In Phase II, the Project Team developed a set of 70 technical requirements for a world-class ship design and production CAD/CAM/CIM system that is future-oriented. In addition, the Team described links between the technical side of shipbuilding and the business side, illustrating the business value of the technical requirements in particular and advanced CAD/CAM/CIM in general. It is hoped that the technical requirements and business links will provide U.S. yards with guide posts which will help those yards not only catch up with, but leapfrog, world-class technology and establish a competitive presence in the international shipbuilding market.
DTIC
Computer Aided Design; Conferences; Marine Technology; Ships; Shipyards

20060021736 Northrop Grumman Information Technology, Inc., Colorado Springs, CO USA
Development of the Quick Automated Tool for Optimization (QATO) Tool Suite to Support the Air Force Space Command's Integrated Planning Process
Tindle, John R; Mellott, Danny L; Jun 23, 2005; 43 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447840; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447840; Avail.: CASI: A03, Hard-copy

Presentation on the development of the Quick Automated Tool for Optimization (QATO) tool suite to support the Air Force Space Command's integrated planning process. Agenda includes: Capabilities; What is QATO?; How the Tools Interact; Additional Capability; Conclusion.
DTIC
Management Planning; Planning; Spreadsheets

20060021743 NRNS, Inc., Ottawa, Ontario Canada
Practical Protection for Public Servers
Spagnolo, Joe; Nov 1, 2004; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447857; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447857; Avail.: CASI: A03, Hard-copy

No abstract available
Computer Information Security; Computer Networks; Data Transmission; Protection; Security

20060021748 IIT Research Inst., Chicago, IL USA
The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 3: A Status Report: The REAPS Autokon System
Taska, Patricia D; Jun 1976; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447864; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447864; Avail.: CASI: A03, Hard-copy

The forerunner of the REAPS AUTOKON System was acquired from Shipping Research Services (SRS) of Norway by the Maritime Administration for use in participating U.S. shipyards. Twelve independent computer programs communicating with a common database accomplish various aspects of ship design and construction. Significant modifications have been made to these programs since their initial release to incorporate enhancements, resolve failures, and improve performance. At present, the REAPS Technical Staff maintains several versions of the system. Maintenance for the REAPS AUTOKON System which was previously limited only to the UNIVAC installation versions has been expanded to cover both UNIVAC and IBM installation versions.
DTIC
Computer Aided Manufacturing; Conferences; Dynamic Structural Analysis; Marine Technology; Ships

20060021749 IIT Research Inst., Chicago, IL USA

The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium (2nd) held in Palm Beach Shores, Florida, on 24-25 Jun 1975: Full Proceedings

Jun 1975; 414 pp.; In English

Report No.(s): AD-A447866; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447866; Avail.: CASI: A18, Hard-copy

The Research and Engineering for Automation and Productivity in Shipbuilding (REAPS) program aims at increasing U.S. shipyard productivity through automation technology. To do so, however, requires the cooperation of all U.S. yards, for without knowing their needs, problems and priorities, a concerted effort lacks force and direction. The 1975 REAPS Technical Symposium, the second annual meeting of U.S. shipbuilders and shipbuilding support agencies, sought to stimulate this spirit of cooperation among U.S. yards. It 'gave cognizance to the advancements in hardware/software technology and how these advancements to the shipbuilding industry. The Proceedings of the 1975 REAPS Technical Symposium contain all the reports presented at the meeting. The Agenda, in Appendix A, lists topics and speakers; while Appendix B is a compendium of the Symposium attendees.

DTIC

Conferences; Marine Technology; Ships

20060021750 IIT Research Inst., Chicago, IL USA

The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 2: The New REAPS Program for U.S. Shipbuilders

Williams, John C; Jun 1976; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447867; NSRP-0002; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447867; Avail.: CASI: A03, Hardcopy

The primary purpose of this discussion is to introduce a new version of the REAPS Program. In 1971 a Maritime Administration (MarAd) Advisory Group recognized a void in the area of computer aided shipbuilding. In response, MarAd acquired rights to the AUTOKON-71 system, the most widely used system in Europe. MarAd and the participating shipyards recognized the need to provide maintenance and support for the AUTOKON system. That effort was sponsored and paid for jointly by the industrial users and the government. It soon became apparent to all concerned that there was much more to be gained from computer applications in the shipyard than just running the AUTOKON system. A total shipyard program for computer automation beyond AUTOKON was needed. It was this decision that gave birth to the Research and Engineering for Automation and Productivity in Shipbuilding (REAPS) program; a joint participation program involving five shipyards, MarAd, and IITRI. Its purpose was to identify and address common problems in ship construction. The advantages were obvious. Participants could pool both the technological know how in identifying and solving problems and their resources to solve a common problem only once not repetitively at every shipyard. The REAPS program, a new concept in cooperative developments among several shipyards, was working. One thing began to change--the objectives of our development projects. Originally, they were oriented to a specific computer system, AUTOKON; now they were becoming non-system oriented, standalone modules with no relationship to a specific computer system or software package. A new concept was needed. The 'new' REAPS program as it has evolved to date is a non-systems oriented program with the separation of all AUTOKON related activities. The overall concept of the new REAPS Program consists of five basic elements: Advance Planning, Technology Assessment, Development Program, Technology Information Services and Discretionary Development.

DTIC

Conferences; Marine Technology; Ships; Shipyards

20060021756 Johns Hopkins Univ., Laurel, MD USA

APL Integrated Multi-warfare Simulation (AIMS): Considering Resource Conflict Resolution and Warfare Area Inter-dependencies in Multi-Warfare Analyses

Kovalchik, Joseph G; Jun 23, 2005; 37 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447876; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447876; Avail.: CASI: A03, Hard-copy

Presentation on Johns Hopkins University Applied Physics Lab's Integrated Multi-warfare Simulation (AIMS); Considering resource conflict resolution and warfare area inter-dependencies in multi-warfare analyses. Agenda includes: Problem addressed; Proposed solution; Simulation federation development; Simulation federation execution; Future work; Summary.

DTIC

Simulation; Systems Integration; Warfare

20060021795 General Dynamics Corp., Quincy, MA USA

The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 19: The Application of Numerical Control Systems to Plan Production, or N/C Part Definition Can Mean Plans Too!

Wichham, Albert P; Kucharski, Raymond W; Jun 1976; 40 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447780; No Copyright; Avail.: CASI: A03, Hardcopy

Parts definition language used to describe ships parts for N/C fabrication can also be used to assist the designer/draftsman in producing ship's plans. Expanded coding techniques developed by General Dynamics allow the efficient application of the AUTOKON Parts Program to provide the interface between the drafting function and the numerically controlled flat - bed plotter.

DTIC

Computer Aided Design; Conferences; Marine Technology; Numerical Control; Ships

20060021796 Shipping Research Services A/S, Oslo, Norway

The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 7: AUTOKON's Approach to Interactive Nesting

Oian, Jorn; Jun 1976; 28 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447790; No Copyright; Avail.: CASI: A03, Hardcopy

The paper presents a new approach to the problem of nesting of plane parts. The system developed is tailored for nesting of production parts for shipyards, more specifically those prepared by the AUTOKON 71/74 system. However, the general design is believed to be independent of any particular part-coding system or application. Geometrically, the problem of nesting is a two-dimensional one, and it is basically similar to any jigsaw puzzle or two-dimensional cutting-stock problem if one disregards all the application considerations that constrain the solution. The programs developed do not attempt any automatic optimization. The philosophy in designing the system has been that the user is capable of optimizing whatever his objective is, if only the computer is able to supply the appropriate information. Defining and applying the constraints required to do automatic nesting not only becomes difficult, it becomes impossible as constraints on the parts layout change dynamically. The system was developed and is, so far, implemented minicomputers NORD-10 and SM-4. The graphics display on the Norwegian used is a Tektronix 4014-1 storage tube. The system is designed to ease conversion to other computers and graphic displays and to interface to other part generation systems with or without databases.

DTIC

Computer Aided Design; Conferences; Marine Technology; Ships

20060021797 Cali and Associates, Inc., New Orleans, LA USA

The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 6: SPADES System Current Developments

Schulze, Albrecht; Jun 1976; 34 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447791; No Copyright; Avail.: CASI: A03, Hardcopy

For enhancement of the SPADES System, three new modules are currently planned and under development: 1) Ship Production and Control Module (SPAC) - A management information system which utilizes the information collected on the SPADES data base. 2) Detail Engineering Module (DEMO) - A module that is designed not only to produce engineering drawings, but to aid in data collection and consequent loading of the data base with information generated by the Engineering Department. 3) Pipe Length and End-Cuts Program (PLEC) - A special program to aid in fabrication of complex three-dimensional pipe structures, which is of special interest to manufacturers of oil rig structures. Like all other modules of SPADES, these new modules will directly access the SPADES data base, utilizing information that has been generated by other modules, and in turn making it. Thus, information is available to the other modules information gathered by collected and stored where it is generated. There will be no need to recreate information by other departments downstream with the duplication of effort and a high probability of errors. The three new modules will continue the expansion of SPADES from an Numerical Control manufacturing method to a computer-controlled information flow throughout the entire design and construction period.

DTIC

Computer Aided Manufacturing; Conferences; Marine Technology; Ships

20060021803 Army Research Lab., Aberdeen Proving Ground, MD USA

SUN-TZU: Proposal for an Agent Based Battle Staff Planning Tool For Analysis of Situation Awareness Data Anomalies

Brand, John; Burns, Devin; Brodeen, Ann; Kaste, Richard; Jun 14, 2005; 35 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447897; No Copyright; Avail.: CASI: A03, Hardcopy

Presentation of SUN-TZU; a proposal for an agent-based battle staff planning tool for analysis of situation awareness data anomalies. Sun-Tzu is a concept for an agent based situational awareness (SA) data base tool intended to find and highlight inconsistencies in the battle SA picture. The goal is to find inconsistencies that might cue the existence of a deception story. It is bottom-up, not top-down. Sources of inconsistency other than deception might be tactically much more valuable: incomplete detection-not sensing things that are there; mistaken detection or interpretation-wrong identification of sensed element; false detection-seeing what isn't there; and mistaken interpretation-wrong picture of reality.

DTIC

Anomalies; Data Bases; Situational Awareness; Sun

20060021812 Army Research Lab., Aberdeen Proving Ground, MD USA

Agile Target Effects Data Management Tool- ATE DMT

Brand, John; Domen, John; Jafrey, Nasir; Yagrich, Ken; Jun 14, 2005; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447907; No Copyright; Avail.: CASI: A03, Hardcopy

Presentation on Agile Target Effects Data Management Tool- ATE DMT. It was developed under Agile Target Effects Systems (ATES) Science and Technology Objective. It was originally a research tool with a narrow application in directed energy. It is a relational database running on Microsoft SQL Server. It links materiel to directed energy (DE) effects database and links materiel to fighting tips. It allows best-guess inferences based on fundamental technology and links targets to 'fighting tips.' It is a multi-use tool for the materiel developer, combat developer and battle staff.

DTIC

Data Management; Military Operations; Planning; Relational Data Bases

20060021813 Carnegie-Mellon Univ., Pittsburgh, PA USA

Product Line Acquisition in a DoD Organization -- Guidance for Decision Makers

Bergey, John; Cohen, Sholom; Mar 2006; 35 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A447911; CMU/SEI-2006-TN-020; No Copyright; Avail.: CASI: A03, Hardcopy

In the Department of Defense (DoD) acquisition environment, many organizations have not seriously considered adopting a product line approach or are reluctant to because it is not a well-understood acquisition paradigm. Nonetheless, a compelling case can be made for adopting a product line approach because it addresses a problem facing many program managers today -- how to cost-effectively acquire, develop, and maintain a set of related software-intensive systems, and how to respond to the needs of greater product agility in the face of the current DoD transformation. This technical note chronicles the decisions a program manager might face in considering the adoption of a product line approach. The report uses a hypothetical acquisition to focus on why an acquisition organization should consider adopting a product line approach -- instead of the traditional stovepipe approach -- when acquiring a number of software-intensive systems that have a lot in common. The note provides program managers with insight into the many benefits of adopting a product line approach, and examines alternative acquisition approaches for acquiring a product line capability. Specifically, the note provides guidance on four basic decisions a DoD acquisitions program manager must make in adopting a product line approach for acquiring software-intensive systems: (1) What is the definition of the software product line for an organization?; (2) What product line acquisition approaches can or should an organization take?; (3) What are the decisions a manager must make in adopting the product line approach?; and (4) What are the benefits, challenges, and risks of the product line approach?

DTIC

Computer Programming; Computer Programs; Defense Program; Management Planning; Procurement; Production Engineering; Software Engineering

20060021818 Naval Research Lab., Washington, DC USA

Representing Mathematical Models on the Web

Collins, Joseph B; Jun 21, 2005; 21 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447918; No Copyright; Avail.: CASI: A03, Hardcopy

Presentation on representing mathematical models, i.e. formulas and equations, on the Web.
DTIC
Internets; Mathematical Models

20060021820 Army Engineer Research and Development Center, Vicksburg, MS USA
Interoperable Common Maneuver Networks for M&S and C2
Gates, Burhman; Goerger, Niki; Richmond, Paul; Blais, Curt; Pace, Mike; Willis, John; Jun 21, 2005; 38 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447922; No Copyright; Avail.: CASI: A03, Hardcopy
Presentation on the development of interoperable common maneuver networks for modeling and simulation and command and control systems. Outline consists of: Concept; Approach; Path Forward; Interoperability- CMN, M-COP, and GeoBML.
DTIC
Combat; Command and Control; Interoperability; Networks; Simulation

20060021821 Military Academy, West Point, NY USA
Exploring Higher-Order Effects of Vehicle Mobility Model Fidelity in M&
Goerger, Simon R; Goerger, Niki C; West, Paul; McFadden, Willie; Jun 22, 2005; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447923; No Copyright; Avail.: CASI: A03, Hardcopy
Presentation on exploring higher-order effects of vehicle mobility model fidelity in modeling and simulation. Outline includes: Problem; Objective and Scope; Selected Previous Related Work; Terms and Definitions; Approach; Critical Issues; Vignettes; Simulations; Emerging Results; Future Work; Summary.
DTIC
Mobility; Models

20060021823 Argonne National Lab., IL USA
Modeling the Impacts on National Security from Disruptions in CONUS Critical Infrastructures
Hummel, John R; Burke, Jr , James F; Cunningham, William B; Jun 21, 2005; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447925; No Copyright; Avail.: CASI: A03, Hardcopy
Presentation on modeling the impacts on national security from disruptions in CONUS critical infrastructures. Outline includes: Why are CONUS infrastructure disruptions important to the military environmental factors community? How do disruptions in CONUS infrastructures impact national security? How can these processes be modeled to provide decision support tools to the planning community? Examples of impacts on national security missions from CONUS infrastructure disruptions; Summary and future directions.
DTIC
Disrupting; Losses; Security; United States

20060021824 Army Research Lab., White Sands Missile Range, NM USA
Rule-Based and Physics-Based Weather Effects and Impacts for AWARS
Shirkey, Richard; O'Brien, Sean; Parker, LeeLinda; Quintis, David; Glasgow, Steven R; Gach, Terry; Jun 23, 2005; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447926; No Copyright; Avail.: CASI: A03, Hardcopy
Presentation on rules-based and physics-based weather effects and impacts for AWARS. The objective of this presentation is to continue the current implementation of weather effects in the AWARS model using methodologies that improve the estimation of weather impacts in the target acquisition algorithms without increasing AWARS run time.
DTIC
Models; Target Acquisition; Weather

20060021825 Army Research Lab., White Sands Missile Range, NM USA
Urban Warfare: Detailing Single Building Airflow, Turbulence and Stability Variation Characteristics
Vaucher, Gail-Tirrell; Cionco, Ronald; Bustillos, Manuel; D'Arcy, Sean; Dumais, Robert; Brice, Robert; Jun 23, 2005; 42 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447927; No Copyright; Avail.: CASI: A03, Hardcopy
Presentation on Urban Warfare: Detailing single building airflow, turbulence and stability variation characteristics.
DTIC
Air Flow; Buildings; Cities; Models; Stability; Thermodynamics; Turbulence

20060021849 Bae Systems Advanced Information Technologies, Inc., Burlington, MA USA
Effects-Based Operations using the Strategy Development Tool
White, Christopher M; Pioch, Nicholas J; Jun 23, 2005; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-C-0047; F30602-01-C-0056
Report No.(s): AD-A447967; No Copyright; Avail.: CASI: A03, Hardcopy
Presentation on Effects-based Operations using the Strategy Development Tool. Outline of the briefing is: Background; SDT Overview; JEFX04 Lessons Learned; Conclusions.
DTIC
Decision Support Systems; Military Operations; Planning

20060021856 Carnegie-Mellon Univ., Pittsburgh, PA USA
U.S. Army Acquisition -- The Program Office Perspective
Keeler, Kristi L; Oct 2005; 68 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A447976; CMU/SEI-2005-SR-014; No Copyright; Avail.: CASI: A04, Hardcopy
The U.S. Army Strategic Software Improvement Program (ASSIP) is a multiyear effort to improve the way the Army acquires software-intensive systems. As part of the ASSIP, the Carnegie Mellon Software Engineering Institute examined 12 of the Army's Acquisition Category 1 (ACAT 1) programs using a method called Benchmarking for Improvement (BFI). The purpose of the BFI evaluations was to define the current state of acquisition practice across the Army to discover best practices, identify software challenges, and develop potential recommendations for Army-wide improvement. The BFI team also provided each program manager (PM) with an independent view of program-level activities and made specific recommendations for improvement. A briefing provided to each PM documented these recommendations. This report documents the results of interviews conducted during BFI evaluations. Some of the themes that surfaced during the interviews with PMs were as follows: (1) risk management practices are not standardized and risks are inconsistently and insufficiently tracked, updated, and addressed; (2) the acquisition policy changes that occurred during the past 5 years have created confusion and difficulties that are exacerbated by operational demands for rapid delivery of early capability; (3) oversight and monitoring of contractors' system engineering and management practices is not executed consistently; (4) PM offices do not employ personnel who have the specialized skills needed to respond to all of the demands of their jobs; (5) PM offices perceive Office of the Secretary of Defense (OSD) and Department of the Army (DA) policy and directives as being in constant flux, which makes it difficult to locate or develop interpretation expertise; (6) PM certification does not sufficiently recognize the value of developmental, operational, TSM, DA, or OSD assignments; and (7) some programs do not execute Integrated Product Teams (IPTs) effectively.
DTIC
Computer Programming; Computer Programs; Government Procurement; Personnel; Project Management; Software Engineering

20060021861 Defense Modeling and Simulation Office, Alexandria, VA USA
Integrated Analysis Tools Military Operations Other Than War
Cipparone, John S; Blais, Curtis; Hartley, III, Dean S; Randolph, Wayne; Jun 23, 2005; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447983; No Copyright; Avail.: CASI: A03, Hardcopy
Presentation on integrated analysis tools for military operations other than war.
DTIC
Military Operations; Models; Warfare

20060021875 Maryland Univ., College Park, MD USA

A Pilot Study to Evaluate Development Effort for High Performance Computing

Basili, Victor; Asgari, Sima; Carver, Jeff; Hochstein, Lorin; Hollingsworth, Jeffrey K; Shull, Forrest; Zelkowitz, Martin V; Jan 2006; 32 pp.; In English; Original contains color illustrations

Report No.(s): AD-A448013; CS-TR-4588; No Copyright; Avail.: CASI: A03, Hardcopy

The ability to write programs that execute efficiently on modern parallel computers has not been fully studied. In a DARPA-sponsored project, we are looking at measuring the development time for programs written for high performance computers (HPC). To attack this relatively novel measurement problem, our goal is to initially measure such development time in student programming to evaluate our own experimental protocols. Based on these results, we will generate a set of feasible experimental methods that can then be applied with more confidence to professional expert programmers. This paper describes a first pilot study addressing those goals. We ran an observational study with 15 students in a graduate level High Performance Computing class at the University of Maryland. We collected data concerning development effort, developer activities and chronology, and resulting code performance, for two programming assignments using different HPC development approaches. While we did not find strong correlations between the expected factors, the primary outputs of this study are a set of experimental lessons learned and 12 well formed hypotheses that will guard future study.

DTIC

Computer Programming; Programmers

20060021879 Military Academy, West Point, NY USA

Process Documentation and Execution: Introducing a Tool to Support Analysis of Alternatives

Dufresne, Thomas A; Turner, Robert L; Jun 23, 2005; 22 pp.; In English; Original contains color illustrations

Report No.(s): AD-A448026; No Copyright; Avail.: CASI: A03, Hardcopy

PROBLEM STATEMENT: Develop software tools to support analytical data preparation processes: Populate authoritative databases * Prepare data for analysis * Post-process model output. What features would you like to see in these tools? Usability * Reliability * Flexibility * Transparency * Repeatability. INTRODUCING .... Process Execution Tool (PET). PET is analogous to Microsoft Project (a graphical display of the tasks/steps in a data preparation process). PET goes a step further than MS Project by supporting the execution of process steps. Process steps are assigned tools (Step Tools), which complete or support the completion of the step.

DTIC

Alternatives; Data Management; Data Processing; Software Development Tools

20060021885 Maryland Univ., College Park, MD USA

Web Service Composition With Volatile Information

Au, Tsz-Chiu; Kuter, Ugur; Nau, Dana; Jan 2006; 16 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0298; IIS0412812

Report No.(s): AD-A448037; No Copyright; Avail.: CASI: A03, Hardcopy

In many Web service composition problems, information may be needed from Web services during the composition process. Existing research on Web service composition (WSC) procedures has generally assumed that this information will not change. We describe two ways to take such WSC procedures and systematically modify them to deal with volatile information. The black-box approach requires no knowledge of the WSC procedure's internals: it places a wrapper around the WSC procedure to deal with volatile information. The gray-box approach requires partial information of those internals, in order to insert coding to perform certain bookkeeping operations. We show theoretically that both approaches work correctly. We present experimental results showing that the WSC procedures produced by the gray-box approach can run much faster than the ones produced by the black-box approach.

DTIC

Context Free Languages; Grammars; Information Theory

20060021888 Bae Systems Advanced Information Technologies, Inc., Burlington, MA USA

Joint Effects-Based Planning using the Strategy Development Tool at JEFX04

White, Christopher M; Pioch, Nicholas J; Jun 23, 2005; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A448044; No Copyright; Avail.: CASI: A03, Hardcopy

CONCLUSIONS: (1) SDT provided EBO support for joint planning during JEFX04. (2) Real-time transparent synchronous collaboration is essential to planning. (3) Air Force and Army planning have some unique requirements that need

to be met in a joint system. (4) Effects based modeling and analysis only appeals to a select few power users. (5) EBO ATD JEFX04 lessons learned can be valuable for future Joint EBO related efforts.
DTIC
Management Planning; Software Development Tools

20060021890 Maryland Univ., College Park, MD USA
A Flexible Approach for Managing Digital Images on the Semantic Web
Halaschek-Wiener, Christian; Schain, Andrew; Golbeck, Jennifer; Grove, Michael; Parsia, Bijan; Hendler, Jim; Jan 2006; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A448049; No Copyright; Avail.: CASI: A03, Hardcopy

As the volume of digital images available on the Web continues to increase, there is a clear need for more advanced techniques for their effective retrieval and management. Recently, there has been an interest in applying Semantic Web technologies to represent the high level content of digital images in a machine processable format. While progress has been made, through a representative use case, we provide motivation for further work in developing more domain independent techniques for both annotating and managing images on the Web. Following this, we present an approach for publishing (OWL) annotations of image content to the Semantic Web, through the loose coupling of an annotation environment with a Semantic Web portal. Additionally, we present an implementation of the approach and describe a hypothetical use case that resulted in a proof-of-concept designed in collaboration with NASA.
DTIC
Data Management; Digital Computers; Electronic Publishing; Image Processing; Internets; Photographs

20060021891 Argonne National Lab., IL USA
An Overview of the Joint Munitions Planning System
Hummel, John R; Winiecki, Alan L; Jul 23, 2005; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A448070; No Copyright; Avail.: CASI: A03, Hardcopy

Presentation of an overview of the Joint Munitions Planning System. Briefing outline includes: Overview of the Joint Munitions Planning System- development history and high level overview, operating environment, key features; Examples of JMPS-developed sourcing solutions; Summary.
DTIC
Logistics; Management Planning; Software Development Tools

20060022073 NASA Johnson Space Center, Houston, TX, USA
Advanced Resistive Exercise Device (ARED) Flight Software (FSW): A Unique Approach to Exercise in Long Duration Habitats
Mangieri, Mark; [2005]; 3 pp.; In English; Space 2005, 30 Aug - Sep. 2005, Reston, VA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

ARED flight instrumentation software is associated with an overall custom designed resistive exercise system that will be deployed on the International Space Station (ISS). This innovative software application fuses together many diverse and new technologies into a robust and usable package. The software takes advantage of touchscreen user interface technology by providing a graphical user interface on a Windows based tablet PC, meeting a design constraint of keyboard-less interaction with flight crewmembers. The software interacts with modified commercial data acquisition (DAQ) hardware to acquire multiple channels of sensor measurment from the ARED device. This information is recorded on the tablet PC and made available, via International Space Station (ISS) Wireless LAN (WLAN) and telemetry subsystems, to ground based mission medics and trainers for analysis. The software includes a feature to accept electronically encoded prescriptions of exercises that guide crewmembers through a customized regimen of resistive weight training, based on personal analysis. These electronically encoded prescriptions are provided to the crew via ISS WLAN and telemetry subsystems. All personal data is securely associated with an individual crew member, based on a PIN ID mechanism.
Derived from text
Flight Instruments; Computer Programs; International Space Station; Physical Exercise; Long Duration Space Flight; Training Devices

20060022167 NASA Ames Research Center, Moffett Field, CA, USA
Software Engineering Research/Developer Collaborations in 2005
Pressburger, Tom; March 07, 2006; 12 pp.; In English; No Copyright; Avail.: CASI: A03, Hardcopy

In CY 2005, three collaborations between software engineering technology providers and NASA software development personnel deployed three software engineering technologies on NASA development projects (a different technology on each project). The main purposes were to benefit the projects, infuse the technologies if beneficial into NASA, and give feedback to the technology providers to improve the technologies. Each collaboration project produced a final report. Section 2 of this report summarizes each project, drawing from the final reports and communications with the software developers and technology providers. Section 3 indicates paths to further infusion of the technologies into NASA practice. Section 4 summarizes some technology transfer lessons learned. Also included is an acronym list.
Derived from text
Software Engineering; Systems Engineering; Research Management; Computer Programming

20060022176 NASA Goddard Space Flight Center, Greenbelt, MD, USA
'GSFC FSB Application of Perspective-Based Inspections'
Shell, Elaine; Shull, Forrest; November 2004; 15 pp.; In English
Contract(s)/Grant(s): NAG5-12556; No Copyright; Avail.: CASI: A03, Hardcopy

The scope of work described in our proposal consisted of developing inspection standards targeted to Branch-specific types of defects (gained from analysis of Branch project defect histories), and including Branch-relevant perspectives and questions to guide defect detection. The tailored inspection guidelines were to be applied on real Branch projects with support as needed from the technology infusion team. This still accurately describes the scope of work performed. It was originally proposed that the Perspective-Based inspection standard would be applied on three projects within the Branch: GPM, JWST, and SDO. Rather than apply the proposed standard to all three, we inserted a new step, in which the standard was instead applied on a single pilot project, cFE (described above). This decision was a good match for the Branch goals since, due to the 'design for reuse' nature of cFE, inspections played an even more crucial than usual role in that development process. Also, since cFE is being designed to provide general-purpose functionality, key representatives fiom our target projects were involved in inspections of cFE to provide perspectives from different missions. In this way, they could get some exposure to and the chance to provide feedback on the proposed standards before applying them on their own projects. The Branch-baselined standards will still be applied on GPM, JWST, and SDO, although outside the time frame of this funding. Finally, we originally proposed using the analysis of Branch defect sources to indicate in which phases Perspective-Based inspections could provide the best potential for future improvement, although experience on previous Branch projects suggested that our efforts would likely be focused on requirements and code inspections. In the actual work, we focused exclusively on requirements inspections, as this was the highest-priority work currently being done on our cFE pilot project.
Derived from text
Exposure; Inspection; Targets; Detection; Defects; Computer Programs

20060022233 Air Force Studies and Analyses Agency, Washington, DC USA
Survivability and Vulnerability Impacts on Mission and Campaign Outcomes: The Role of the AFSAT
Nichols, Sharon R; Crowder, George E; Jun 23, 2005; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447935; No Copyright; Avail.: CASI: A03, Hardcopy

AFSAT: What is it? (1) The Air Force Standard Analysis Toolkit (AFSAT). (2) Foundational set of AF analytic community (AFAC) accepted modeling and simulation (M&S) tools. (3) Goals: Improve consistency and quality of AF analyses - Standardize model management, configuration management, VV&A, etc., best practices across the AF analytic community - Provide framework for analytic M&S capability investments. (4) Oversight: AFAC Steering Group provides direction and guidance - AFSAA/SAA executive agent - Subject Matter Expert model managers (MM) responsible for individual models.
DTIC
Vulnerability; Survival; Configuration Management; Procedures

20060022524 Center for Army Analysis, Fort Belvoir, VA USA
Mission Task Organized Forces Decision Support System
Rogers, Kyle; Jun 23, 2005; 31 pp.; In English; Original contains color illustrations
Report No.(s): AD-A448017; No Copyright; Avail.: CASI: A03, Hardcopy

Presentation of Mission Task Organized Forces decision support system, phase 1. Agenda of the briefing includes: problem statement; background; purpose and objectives; key definitions; scope; assumptions; limitations; approach;

methodology; demonstration; study products; validation and QA measures; study schedule; way ahead.
DTIC
Decision Support Systems; Schedules

62
COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20060021652 Newport News Shipbuilding and Drydock Co., VA USA
The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 3: A Low Cost Parts Definition System
Kaun, Arthur F; Jun 1977; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447686; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447686; Avail.: CASI: A02, Hardcopy

Presentation discusses a Computer Aided Design (CAD) system in development incorporating off the shelf components.
DTIC
Computer Aided Design; Conferences; Low Cost; Marine Technology; Ships

20060021720 Fraunhofer-IGD, Darmstadt, Germany
Tempering Network Stacks
Wolthusen, Stephen D; Nov 1, 2004; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447809; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447809; Avail.: CASI: A03, Hardcopy

No abstract available
Computer Networks; Policies; Security; Stacks; Tempering

20060021757 Defense Modeling and Simulation Office, Alexandria, VA USA
Modeling and Simulation Applications on the Global Information Grid
Leite, Michael J; Jun 23, 2005; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447878; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447878; Avail.: CASI: A03, Hardcopy

Presentation on Modeling and Simulation Applications on the Global Information Grid. The Global Information Grid (GIG) is a major restructuring of DoD communications and information infrastructure; an implementation of Net-centric Warfare concept; modeled on the Internet; and is a major opportunity for modeling and simulation to support operating forces.
DTIC
Communication Networks; Computer Networks; Simulation; Systems Integration

20060021853 Maryland Univ., College Park, MD USA
Automating DAML-S Web Services Composition Using SHOP2
Wu, Dan; Parsia, Bijan; Sirin, Evren; Hendler, James; Nau, Dana; Jan 2006; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-2-0505
Report No.(s): AD-A447972; No Copyright; Avail.: CASI: A03, Hardcopy

The DAML-S Process Model is designed to support the application of AI planning techniques to the automated composition of Web services. SHOP2 is an Hierarchical Task Network (HTN) planner well-suited for working with the Process Model. We have proven the correspondence between the semantics of SHOP2 and the situation calculus semantics of the Process Model. We have also implemented a system which soundly and completely plans over sets of DAML-S descriptions using a SHOP2 planner, and then executes the resulting plans over the Web. We discuss the challenges and difficulties of using SHOP2 in the information-rich and human-oriented context of Web services.
DTIC
Internets; Models; Planning

20060021874 Maryland Univ., College Park, MD USA
Representing Web Service Policies in OWL-DL
Kolovski, Vladimir; Parsia, Bijan; Katz, Yarden; Hendler, James; Jan 2006; 16 pp.; In English
Report No.(s): AD-A448010; No Copyright; Avail.: CASI: A03, Hardcopy

Recently, there have been a number of proposals for languages for expressing web service constraints and capabilities, with WS-Policy and WSPL leading the way. The proposed languages, although relatively inexpressive, suffer from a lack of formal semantics. In this paper, we provide a mapping of WS-Policy to the description logic fragment species of the Web Ontology Language (OWL-DL), and describe how standard OWL-DL reasoners can be used to check policy conformance and perform an array of policy analysis tasks. OWL-DL is much more expressive than WS-Policy and thus provides a framework for exploring richer policy languages.
DTIC
Internets; Policies; Protocol (Computers)

20060022156 NASA Ames Research Center, Moffett Field, CA, USA
Impact of the Columbia Supercomputer on NASA Space and Exploration Mission
Biswas, Rupak; Kwak, Dochan; Kiris, Cetin; Lawrence, Scott; [2006]; 8 pp.; In English; Second International Conference on Space Mission Challenges for Information Technology 2006, 17-21 Jul. 2006, Pasadena, CA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

NASA's 10,240-processor Columbia supercomputer gained worldwide recognition in 2004 for increasing the space agency's computing capability ten-fold, and enabling U.S. scientists and engineers to perform significant, breakthrough simulations. Columbia has amply demonstrated its capability to accelerate NASA's key missions, including space operations, exploration systems, science, and aeronautics. Columbia is part of an integrated high-end computing (HEC) environment comprised of massive storage and archive systems, high-speed networking, high-fidelity modeling and simulation tools, application performance optimization, and advanced data analysis and visualization. In this paper, we illustrate the impact Columbia is having on NASA's numerous space and exploration applications, such as the development of the Crew Exploration and Launch Vehicles (CEV/CLV), effects of long-duration human presence in space, and damage assessment and repair recommendations for remaining shuttle flights. We conclude by discussing HEC challenges that must be overcome to solve space-related science problems in the future.
Author
Supercomputers; Reliability Analysis; Performance Prediction; Computerized Simulation; High Speed

20060022179 NASA Ames Research Center, Moffett Field, CA, USA
Distributed Web-Based Expert System for Launch Operations
Bardina, Jorge E.; Thirumalainambi, Rajkumar; [2005]; 7 pp.; In English; Winter Simulation COnference 2005, 4-7 Dec. 2005, Orlando, FL, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

The simulation and modeling of launch operations is based on a representation of the organization of the operations suitable to experiment of the physical, procedural, software, hardware and psychological aspects of space flight operations. The virtual test bed consists of a weather expert system to advice on the effect of weather to the launch operations. It also simulates toxic gas dispersion model, and the risk impact on human health. Since all modeling and simulation is based on the internet, it could reduce the cost of operations of launch and range safety by conducting extensive research before a particular launch. Each model has an independent decision making module to derive the best decision for launch.
Author
Spacecraft Launching; Decision Making; Flight Operations; Expert Systems; Weather Forecasting; Internets; World Wide Web; Simulation

20060022221 Naval Surface Warfare Center, Panama City, FL USA
Simulation and Analysis Support of Counter Mine/Counter Obstacle System Development
Thompson, Michael; Jun 23, 2005; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447962; No Copyright; Avail.: CASI: A03, Hardcopy

Presentation on Simulation and Analysis Support of Counter Mine/Counter Obstacle System Development. Structure of the briefing is: Assault breaching system of systems engineering; analysis of alternatives; simulation toolsets.
DTIC
Countermeasures; Simulation; Systems Engineering

20060022635 Advanced Management Technology, Inc., Moffett Field, CA, USA, Computer Sciences Corp., Moffett Field, CA, USA

Master Software Requirements Specification

Hu, Chaumin; January 29, 2003; 46 pp.; In English

Contract(s)/Grant(s): DlTS59-99-D-00437/A618I2D; No Copyright; Avail.: CASI: A03, Hardcopy

A basic function of a computational grid such as the NASA Information Power Grid (IPG) is to allow users to execute applications on remote computer systems. The Globus Resource Allocation Manager (GRAM) provides this functionality in the IPG and many other grids at this time. While the functionality provided by GRAM clients is adequate, GRAM does not support useful features such as staging several sets of files, running more than one executable in a single job submission, and maintaining historical information about execution operations. This specification is intended to provide the environmental and software functional requirements for the IPG Job Manager V2.0 being developed by AMTI for NASA.

Derived from text

Computer Programming; Functional Design Specifications; Grid Computing (Computer Networks); Resource Allocation; Computer Networks; Computational Grids; User Requirements

63
CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20060021577 Lucent Technologies, Mc Leansville, NC USA

Reasoning by Augmenting a Description Logic Reasoner (Phase 1)

Patel-Schneider, Peter F; Apr 28, 2006; 169 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): HR0011-05-C-0094; ARPA ORDER-T973

Report No.(s): AD-A447340; No Copyright; Avail.: CASI: A08, Hardcopy

This is the final report on the DARPA IPTO project Reasoning by Augmenting a Description Logic Reasoner (Phase I) contract HR0011-05-C-0094, providing information on the objectives or the program and how these objectives were addressed. The Reasoning by Augmenting a Description Logic Reasoner Project (Phase I) was designed to provide languages and tools for reasoning about information expressed in expressive Description Logics or ontology languages similar to the W3C OWL DL Web Ontology Language. The results or the project were designs or new Description Logics and new reasoning methods and optimizations for these Description Logics as well as the PaCT++ Description Logic reasoner.

DTIC

Augmentation; Languages; Semantics; Expert Systems

20060021707 Brigham Young Univ., Provo, UT USA

Experimental Demonstration of Multiple Robot Cooperative Target Intercept

McLain, Timothy W; Beard, Randal W; Kelsey, Jed M; Jan 2002; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-01-1-0091

Report No.(s): AD-A447775; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447775; Avail.: CASI: A02, Hardcopy

This paper presents experimental results for the simultaneous intercept of preassigned targets by a team of mobile robots. The robots are programmed to mimic the dynamic behavior of unmanned air vehicles in constant-altitude flight. In proceeding to their targets, robots must avoid both known static threats and pop-up threats. An overview of the cooperative control strategy followed is given, as well as a description of the robot hardware and software used. Experimental results demonstrating simultaneous intercept of targets by the robot team are presented.

DTIC

Interception; Robots; Targets

20060021806 Maryland Univ., College Park, MD USA

Generating Predictive Movie Recommendations from Trust in Social Networks

Golbeck, Jennifer; Jan 2006; 16 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447900; No Copyright; Avail.: CASI: A03, Hardcopy

Social networks are growing in number and size, with hundreds of millions of user accounts among them. One added

benefit of these networks is that they allow users to encode more information about their relationships than just stating who they know. In this work, the authors are particularly interested in trust relationships, and how they can be used in designing interfaces. In this paper, they present FilmTrust, a web site that uses trust in web-based social networks to create predictive movie recommendations. Using the FilmTrust system as a foundation, they show that these recommendations are more accurate than other techniques when the user's opinions about a film are divergent from the average. They discuss this technique both as an application of social network analysis and how it suggests other analyses that can be performed to help improve collaborative filtering algorithms of all types.
DTIC
Expert Systems; Human Relations; Internets; Motion Pictures; Networks; Predictions

20060021828 Maryland Univ., College Park, MD USA
Inferring Trust Relationships in Web-Based Social Networks
Golbeck, Jennifer; Hendler, James; Jan 2006; 42 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447930; No Copyright; Avail.: CASI: A03, Hardcopy

The growth of web-based social networking and the properties of those networks have created great potential for producing intelligent software that integrates a user's social network and preferences. This research focuses on the concept of trust in social networks. The goal of the work is to use explicit trust ratings that describe direct connections between people in social networks and compose this information to infer the trust that may exist between two people who are not directly connected. The paper presents two variations on an algorithm to make this calculation in networks in which users rate one another on a binary scale (trusted or not trusted). The authors begin by presenting a definition of trust and illustrating how it fits in with making trust ratings in web-based social networks. For both algorithms, the objective is to infer trust values that are accurate to the person for whom they are calculated. They introduce each algorithm in detail, followed by a theoretical analysis that shows why highly accurate results can be expected. This is reinforced through simulation that demonstrates the correctness in simulated networks. Finally, they demonstrate the potential of using inferred trust values to create trust-aware applications through a prototype of TrustMail, an e-mail client that uses trust ratings as a mechanism to filter e-mail.
DTIC
Expert Systems; Human Relations; Internets; Networks

20060021894 Maryland Univ., College Park, MD USA
Learning Approximate Preconditions for Methods in Hierarchical Plans
Ilghami, Okhtay; Munoz-Avila, Hector; Nau, Dana S; Aha, David W; Jan 2005; 9 pp.; In English
Contract(s)/Grant(s): N00173-04-1-G033; FA9550-05-1-0298
Report No.(s): AD-A448076; No Copyright; Avail.: CASI: A02, Hardcopy

A significant challenge in developing planning systems for practical applications is the difficulty of acquiring the domain knowledge needed by such systems. One method for acquiring this knowledge is to learn it from plan traces, but this method typically requires a huge number of plan traces to converge. In this paper, we show that the problem with slow convergence can be circumvented by having the learner generate solution plans even before the planning domain is completely learned. Our empirical results show that these improvements reduce the size of the training set that is needed to find correct answers to a large percentage of planning problems in the test set.
DTIC
Approximation; Machine Learning

20060022015 Research Inst. for Advanced Computer Science, Moffett Field, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA
Verification of Autonomous Systems for Space Applications
Brat, G.; Denney, E.; Giannakopoulou, D.; Jonsson, A.; [2006]; 10 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Autonomous software, especially if it is based on model, can play an important role in future space applications. For example, it can help streamline ground operations, or, assist in autonomous rendezvous and docking operations, or even, help recover from problems (e.g., planners can be used to explore the space of recovery actions for a power subsystem and implement a solution without (or with minimal) human intervention). In general, the exploration capabilities of model-based systems give them great flexibility. Unfortunately, it also makes them unpredictable to our human eyes, both in terms of their execution and their verification. The traditional verification techniques are inadequate for these systems since they are mostly

based on testing, which implies a very limited exploration of their behavioral space. In our work, we explore how advanced V&V techniques, such as static analysis, model checking, and compositional verification, can be used to gain trust in model-based systems. We also describe how synthesis can be used in the context of system reconfiguration and in the context of verification.
Author
Autonomy; Technology Utilization; Program Verification (Computers); Computer Systems Programs

20060022037 iRobot, Inc., Burlington, MA, USA
All-Terrain Intelligent Robot Braves Battlefront to Save Lives
Spinoff 2005; 2005, pp. 20-21; In English; See also 20060022016; Original contains color illustrations; No Copyright; Avail.: CASI: E99, Hardcopy; No Charge

As NASA s lead center for creating robotic spacecraft and rovers, the Jet Propulsion Laboratory (JPL) builds smart machines that can perform very complicated tasks, far, far away from the homeland. JPL s robotic proficiency is making an impact millions of miles away on Mars, where two rovers are presently unlocking the secrets of the Red Planet s rugged terrain, and thousands of miles away in the embattled regions of Iraq and Afghanistan, where robots sown from the seeds of JPL machines have been deployed to be the 'eyes and ears' of humans on the front line. This commercial offspring, known as the PackBot Tactical Mobile Robot, is manufactured by iRobot, Inc., of Burlington, Massachusetts.
Derived from text
Robotics; Roving Vehicles; Robots; Abilities

20060022172 NASA Ames Research Center, Moffett Field, CA, USA
A Preliminary Study of Peer-to-Peer Human-Robot Interaction
Fong, Terrence; Flueckiger, Lorenzo; Kunz, Clayton; Lees, David; Schreiner, John; Siegel, Michael; Hiatt, Laura M.; Nourbakhsh, Illah; Simmons, Reid; Ambrose, Robert, et al.; [2006]; 6 pp.; In English; Systems, Mau, and Cybernetics, 8-11 Oct. 2006, Taipei, Taiwan, Province of China; Original contains black and white illustrations
Contract(s)/Grant(s): HRT-ICP-04-0000-0155; Copyright; Avail.: CASI: A02, Hardcopy

The Peer-to-Peer Human-Robot Interaction (P2P-HRI) project is developing techniques to improve task coordination and collaboration between human and robot partners. Our work is motivated by the need to develop effective human-robot teams for space mission operations. A central element of our approach is creating dialogue and interaction tools that enable humans and robots to flexibly support one another. In order to understand how this approach can influence task performance, we recently conducted a series of tests simulating a lunar construction task with a human-robot team. In this paper, we describe the tests performed, discuss our initial results, and analyze the effect of intervention on task performance.
Author
Human Performance; Robots; Space Missions; Coordination

20060022175 NASA Ames Research Center, Moffett Field, CA, USA
Adaptive Inner-Loop Rover Control
Kulkarni, Nilesh; Ippolito, Corey; Krishnakumar, Kalmanje; Al-Ali, Khalid M.; [2006]; 8 pp.; In English; SMC-IT, 17-21 Jul. 2006, Pasadena, CA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

Adaptive control technology is developed for the inner-loop speed and steering control of the MAX Rover. MAX, a CMU developed rover, is a compact low-cost 4-wheel drive, 4-wheel steer (double Ackerman), high-clearance agile durable chassis, outfitted with sensors and electronics that make it ideally suited for supporting research relevant to intelligent teleoperation and as a low-cost autonomous robotic test bed and appliance. The design consists of a feedback linearization based controller with a proportional - integral (PI) feedback that is augmented by an online adaptive neural network. The adaptation law has guaranteed stability properties for safe operation. The control design is retrofit in nature so that it fits inside the outer-loop path planning algorithms. Successful hardware implementation of the controller is illustrated for several scenarios consisting of actuator failures and modeling errors in the nominal design.
Author
Actuators; Adaptive Control; Error Analysis; Robotics; Steering; Stability; Durability; Controllers

20060022178 NASA Ames Research Center, Moffett Field, CA, USA
Common Metrics for Human-Robot Interaction
Steinfeld, Aaron; Lewis, Michael; Fong, Terrence; Scholtz, Jean; Schultz, Alan; Kaber, David; Goodrich, Michael; [2006]; 8 pp.; In English; Human-Robot Interaction Conference/ACM, 2-4 Mar. 2006, Salt Lake CIty, UT, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

This paper describes an effort to identify common metrics for task-oriented human-robot interaction (HRI). We begin by discussing the need for a toolkit of HRI metrics. We then describe the framework of our work and identify important biasing factors that must be taken into consideration. Finally, we present suggested common metrics for standardization and a case study. Preparation of a larger, more detailed toolkit is in progress.
Author
Artificial Intelligence; Robotics; Robots; Human-Computer Interface; Human Factors Engineering

20060022522 NASA Johnson Space Center, Houston, TX, USA
Robotic Assistance for Human Planetary and Lunar Exploration
Tyree, Kimberly S.; [2004]; 1 pp.; In English; Space 2004, 28-30 Sep. 2004, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Human exploration of space will need robotic assistance in many areas. The type and functionality of such robots needs to be more clearly defined as we resume human missions to the moon and begin human missions to Mars. This paper will identify possible robotic assistants, including their control modes, workplaces, and physical attributes. Current JSC human-robot interaction projects are described, and lessons learned from extensive field tests are given. Future scenario considerations are then detailed. Earth-based testing of varied robotic assistants will provide a means of defining what capabilities are needed for future exploration.
Author
Lunar Exploration; Space Exploration; Robotics; Robots; Mars Missions

20060022538 NASA Johnson Space Center, Houston, TX, USA
Robonaut's Flexible Information Technology Infrastructure
Askew, Scott; Bluethmann, William; Alder, Ken; Ambrose, Robert; [2003]; 2 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAS9-19100; No Copyright; Avail.: Other Sources; Abstract Only

Robonaut, NASA's humanoid robot, is designed to work as both an astronaut assistant and, in certain situations, an astronaut surrogate. This highly dexterous robot performs complex tasks under telepresence control that could previously only be carried out directly by humans. Currently with 47 degrees of freedom (DOF), Robonaut is a state-of-the-art human size telemanipulator system. while many of Robonaut's embedded components have been custom designed to meet packaging or environmental requirements, the primary computing systems used in Robonaut are currently commercial-off-the-shelf (COTS) products which have some correlation to flight qualified computer systems. This loose coupling of information technology (IT) resources allows Robonaut to exploit cost effective solutions while floating the technology base to take advantage of the rapid pace of IT advances. These IT systems utilize a software development environment, which is both compatible with COTS hardware as well as flight proven computing systems, preserving the majority of software development for a flight system. The ability to use highly integrated and flexible COTS software development tools improves productivity while minimizing redesign for a space flight system. Further, the flexibility of Robonaut's software and communication architecture has allowed it to become a widely used distributed development testbed for integrating new capabilities and furthering experimental research.
Author
Robots; Technology Utilization; Astronauts; Telerobotics

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20060021442 Science Applications International Corp., Annapolis, MD USA
Design and Assessment of Ship Motion Control Systems with Advanced Numerical Simulation Tools
Lin, Woei-Min; Weems, Kenneth M; Liut, Daniel A; Oct 2004; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A446796; No Copyright; Avail.: CASI: A03, Hardcopy

No abstract available
Computerized Simulation; Control; Control Systems Design; Numerical Analysis; Ships

20060021671 California Inst. of Tech., Pasadena, CA USA

Variants of the Chandy-Misra-Bryant Distributed Discrete-Event Simulation Algorithm

Su, Wen-King; Seitz, Charles L; Dec 19, 1988; 16 pp.; In English

Contract(s)/Grant(s): N00014-87-K-0745; DARPA ORDER-6202

Report No.(s): AD-A447721; CALTECH-CS-TR-88-22; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447721; Avail.: CASI: A03, Hardcopy

We have been using variants of the Chandy-Misra-Bryant (CMB) distributed discrete-event simulation algorithm since 1986 for a variety of simulation tasks. The simulation programs run on multicomputers (message-passing concurrent computers), such as the Cosmic Cube, Intel iPSC, and Ametek Series 2010. The excellent performance of these simulators led us to investigate a family of variants of the basic CMB algorithm, including lazy message-sending, demand-driven operation with backward demand messages, and adaptive adjustment of the parameters that control the laziness. These studies were also motivated by our interest in scheduling strategies for re-active (message-driven) multiprocess programs which are semantically similar to discrete-event (event-driven) simulators. The simulator itself is implemented in the reactive programming environment that we have developed for multicomputers: the Cosmic Environment and the Reactive Kernel. We performed the studies reported here using logic networks. Logic simulation is expected to stress a distributed simulator, and is itself of practical interest. It is easy to construct examples of logic networks with a diversity of behaviors and structural difficulties, such as large fan-in and fan-out. Low-level logic elements such as logic gates exhibit responses in which an input event may or may not influence the outputs, depending on the internal state of the element and on the states of other inputs; yet, they require very little computation to simulate their behavior. Thus, the performance results shown later in this paper involve practically no computation other than the distributed simulation itself.

DTIC

Algorithms; Discrete Functions; Networks; Probability Distribution Functions; Simulation

20060021676 California Inst. of Tech., Pasadena, CA USA

A Message-Passing Model for Highly Concurrent Computation

Martin, Alain J; Jan 1988; 10 pp.; In English

Contract(s)/Grant(s): N00014-79-C-0597; ARPA ORDER-3771

Report No.(s): AD-A447726; CALTECH-CS-TR-88-13; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447726; Avail.: CASI: A02, Hardcopy

Based on essentially the same computational model as the Torus, the cube uses a binary n-cube network instead of toroidal mesh, with the requested hardware upgrading of the nodes: a more powerful processor with a floating-point co-processor, a larger storage, full-duplex asynchronous channels. A version of C, extended with communication primitives is available as programming language, together with the required support software for loading the programs into the nodes. An important difference with the Torus, however, is the availability in the Cosmic Cube of a deadlock-free protocol for routing messages between any two nodes. The Torus was built on the premiss that locality of communication should be maintained by the programs; such a system is called a processing surface. The Cosmic Cube drops the locality requirement by providing a routing protocol between arbitrary nodes. The Cosmic Cube prototype proved so successful that the design was licensed and rapidly commercialized (1985). Several manufacturers are already offering ‘cube machines’ which are routinely used by researchers at Caltech and elsewhere to solve computationally demanding scientific problems.

DTIC

Computation; Computer Programming; Messages; Models; Protocol (Computers); Software Engineering

20060021678 Colorado Univ., Boulder, CO USA

Prototyping and Simulating Parallel, Distributed Computations with VISA

Demeure, Isabelle M; Nutt, Gary J; Nov 1989; 28 pp.; In English

Contract(s)/Grant(s): AFOSR-85-0251; NSF-CCR-8802283

Report No.(s): AD-A447729; CU-CS-450-89; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447729; Avail.: CASI: A03, Hardcopy

Designing high performance distributed computations is a challenging task. In this paper, we describe VISA (VISual Assistant), a software too] to support the design, prototyping, and simulation of parallel, distributed computations. In particular, VISA is meant to guide the choice of partitioning and communication strategies for such computations, based on their performance. VISA uses ParaDiGM (Parallel Distributed Computation Graph Model) as a basis for its graphical interface. VISA supports the editing of ParaDiGM graphs, and the animation of these graphs to provide visual feedback during simulations. Summary results are available when a simulation terminates. We introduce the ParaDiGM constructs and describe

the functionality of VISA. We illustrate its utility by providing simulations of two computations under various load conditions.
DTIC
Computer Programs; Prototypes; Simulation; Software Development Tools

20060021807 Naval Research Lab., Bay Saint Louis, MS USA
High Resolution Characterization of Riverine and Coastal Currents
Blain, Cheryl A; Massey, T C; Estrade, Brett D; Jun 21, 2005; 35 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447901; No Copyright; Avail.: CASI: A03, Hardcopy

Predictive Capability for Coastal Circulation: High resolution (meters) currents and water levels in littoral environments that include bays, inter-tidal marshes and rivers. ADCIRC Model includes 3D dynamics, details of forcing from tides, wind, waves and rivers; shoreline inundation/recession; uses unstructured grids(based on finite elements) and MPI parallelization.
DTIC
Coastal Currents; Coasts; Finite Element Method; High Resolution; Models

20060021816 Nanyang Technological Univ., Nanyang, Singapore
Simulation of Flow Past an Oscillating Triangular Cylinder using Finite Element Method
Srigrarom, Sutthiphong; Apr 14, 2005; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447915; No Copyright; Avail.: CASI: A02, Hardcopy

This paper is related to the characteristics, the development and the simulation of a particular fluid-structure interaction phenomenon -- the continuous oscillation of an equilateral triangular cylinder in the uniform incoming flow. We propose the explanation of this oscillation. Preliminary analysis indicates that the cylinder could oscillate incessantly by initial positional perturbation or incoming flow fluctuation. It is the unbalance force acting on the cylinder's side faces that causes such movement. On one side, the flow will be flow-past-flat-plate like, whereas the other side will be flow-past-sharp-edge like. Due to the unbalanced pressure exerting on the two sides, the cylinder rotates. When the cylinder moves, these mechanisms switch side interchangeably, and bring the cylinder to continuous oscillation.
DTIC
Finite Element Method; Fluid Flow; Oscillating Cylinders; Oscillations; Simulation

20060021850 Maryland Univ., College Park, MD USA
Automatic Web Services Composition Using SHOP2
Wu, Dan; Sirin, Evren; Hendler, James; Nau, Dana; Parsia, Bijan; Jan 2006; 8 pp.; In English
Contract(s)/Grant(s): F30602-00-2-0505
Report No.(s): AD-A447969; No Copyright; Avail.: CASI: A02, Hardcopy

Semantic markup of Web services will enable the automation of various kinds of tasks, including discovery, composition, and execution of Web services. We describe how an AI planning system (SHOP2) can be used with DAML-S Web service descriptions to automatically compose Web services.
DTIC
Planning; Semantics

20060021855 Maryland Univ., College Park, MD USA
SHOP and M-SHOP: Planning With Ordered Task Decomposition
Nau, Dana; Cao, Yue; Lotem, Amnon; Munoz-Avila, Hector; Jan 2006; 36 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAL01-97-K-0135; N00173-98-1-G007
Report No.(s): AD-A447975; No Copyright; Avail.: CASI: A03, Hardcopy

SHOP (Simple Hierarchical Ordered Planner) and M-SHOP (Multi-task-list SHOP) are HTN planning algorithms with the following characteristics. SHOP and M-SHOP plan for tasks in the same order that they will later be executed. This avoids some task interaction issues that arise in other HTN planners, making the planning algorithms relatively simple. This also makes it easy to prove soundness and completeness results. Since SHOP and M-SHOP know the complete world-state at each step of the planning process, they can use highly expressive domain representations. For example, they can do planning problems that require Horn-clause inferencing, complex numeric computations, and calls to external programs. In our tests, SHOP and M-SHOP were several orders of magnitude faster than Blackbox, IPP, and UMCP, and were several times as fast as TLplan. The approach is powerful enough to be used in complex real-world planning problems. For example, we are using a Java implementation of SHOP as part of the HICAP plan-authoring system for Noncombatant Evacuation Operations

(NEOs). In this paper we describe SHOP and M-SHOP, present soundness and completeness results for them, and compare them experimentally to Blackbox, IPP, TLplan, and UMCP. The results suggest that planners that generate totally ordered plans starting from the initial state can scale up to complex planning problems better than planners that use partially ordered plans.
DTIC
Algorithms; Decomposition; Planning

20060021964 Boeing Co., Seattle, WA USA
Dynamic Analysis of Shells Using Doubly-Curved Finite Elements
Greene, B E; Jones, R E; McLay, R W; Strome, D R; Oct 1968; 29 pp.; In English
Contract(s)/Grant(s): F33615-67-C-1661
Report No.(s): AD-A446712; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA446712; Avail.: CASI: A03, Hard-copy

This paper discusses the theoretical development of a computer program for the static and dynamic analysis of general shell structures. The theory is based on the finite element concept and uses both the generalized finite element method and the direct stiffness method to form the pertinent equations. The treatment of shell surface geometry, the displacement functions and elemental degrees of freedom, and the modification of the generalized stiffness method required for the implementation of the triangular element are described. The correlation of both theoretical and experimental results with those obtained by the present method are shown along with idealizations required for accurate results. Static and dynamic solution results are compared,
DTIC
Finite Element Method; Mass; Stiffness; Structural Analysis

20060022197 Military Academy, West Point, NY USA
Infrastructure Assessment Methodology
Lindberg, T J; Manous, Jr , Joe; Welch, Ronald; Trainor, Timothy; Jun 23, 2005; 43 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447984; No Copyright; Avail.: CASI: A03, Hardcopy

PROBLEM STATEMENT: Develop an infrastructure assessment methodology that facilitates the allocation of infrastructure renewal resources within a particular region in order to foster a climate within a country or region that promotes the self-sufficiency of the affected country or region.
DTIC
Climate; Methodology

20060022537 Philco-Ford Corp., Palo Alto, CA USA
Structural Survivability Analysis
Melosh, R J; Johnson, J R; Luik, Rein; Oct 1968; 35 pp.; In English
Contract(s)/Grant(s): AF-33(615)-5039
Report No.(s): AD-A447770; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447770; Avail.: CASI: A03, Hard-copy

Structural survivability studies require analysis of many similar structures. This paper describes a modification of the multiple configuration analysis technique of Melosh and Lulk (Reference 1) to perform fail-safe and invulnerability evaluations. The process incorporates the displacement approach and the finite-element concept for analysis of the initial structural system. Response predictions for the modified structures use the direct, the complementary energy and the potential energy methods. The approach yields approximate response predictions with accuracy decreasing directly with the number of damage steps. Applications illustrate the nature of the fail-safe analysis and the accuracy of invulnerability analyses. Described herein, a technique for approximate analysis, using the fail-safe results as a basis, shows its accuracy as a function of the number of damage steps.
DTIC
Structural Analysis; Fail-Safe Systems; Energy Methods

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20060021639 North Carolina State Univ., Raleigh, NC USA
Modeling and Estimating Uncertainty in Parameter Estimation
Banks, H T; Bihari, Kathleen L; Jan 1999; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-98-1-0180; F49620-95-1-0447
Report No.(s): AD-A447550; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447550; Avail.: Defense Technical Information Center (DTIC)

In this paper we discuss questions related to reliability or variability of estimated parameters in deterministic least squares problems. By viewing the parameters for the inverse problem as realizations for a random variable we are able to use standard results from probability theory to formulate a tractable probabilistic framework to treat this uncertainty. We discuss method stability and approximate problems and are able to show convergence of solutions of the approximate problems to those of the original problem. The efficacy of our approach is demonstrated in numerical examples involving estimation of constant parameters in differential equations.
DTIC
Estimates; Estimating; Independent Variables; Parameter Identification

20060021851 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Feasibility Study Of Variance Reduction In The THUNDER Campaign Level Model
Bednar, Earl; Miller,; Jun 22, 2005; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447970; No Copyright; Avail.: CASI: A03, Hardcopy

Presentation on a feasibility study of variance reduction in the THUNDER campaign-level model. Overview of the briefing: Objective; THUNDER; Methodology; Analysis; Conclusions.
DTIC
Analysis of Variance; Feasibility; Military Operations

20060021901 Navy Personnel Research Studies and Technology, Millington, TN USA
An Experimental Analysis of the Relative Efficiency of Alternative Assignment Auction Formats
Nimon, R W; Hall, Ricky; Jun 23, 2005; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A448088; No Copyright; Avail.: CASI: A03, Hardcopy

Basic Structure of the Experiments: (1) Subjects are presented with list of jobs. (2) Total Score = Fitness Score + Bid Score. (3) Optimization across Total Scores determines assignments. (4) For each job the bidder's reservation wage (RW) is given. (5) For the awarded job the subject receives Gamebucks = Bid-RW. (6) Subjects exchange their Gamebucks for US dollars at a pre-announced exchange rate. This is their payment.
DTIC
Computer Programs; Format

20060022174 NASA Ames Research Center, Moffett Field, CA, USA
Using Correlation to Compute Better Probability Estimates in Plan Graphs
Bryce, Daniel; Smith, David E.; [2006]; 8 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

Plan graphs are commonly used in planning to help compute heuristic 'distance' estimates between states and goals. A few authors have also attempted to use plan graphs in probabilistic planning to compute estimates of the probability that propositions can be achieved and actions can be performed. This is done by propagating probability information forward through the plan graph from the initial conditions through each possible action to the action effects, and hence to the propositions at the next layer of the plan graph. The problem with these calculations is that they make very strong independence assumptions - in particular, they usually assume that the preconditions for each action are independent of each other. This can lead to gross overestimates in probability when the plans for those preconditions interfere with each other. It can also lead to gross underestimates of probability when there is synergy between the plans for two or more preconditions. In this paper we introduce a notion of the binary correlation between two propositions and actions within a plan graph, show how to propagate this information within a plan graph, and show how this improves probability estimates for planning. This

notion of correlation can be thought of as a continuous generalization of the notion of mutual exclusion (mutex) often used in plan graphs. At one extreme (correlation=0) two propositions or actions are completely mutex. With correlation = 1, two propositions or actions are independent, and with correlation \g 1, two propositions or actions are synergistic. Intermediate values can and do occur indicating different degrees to which propositions and action interfere or are synergistic. We compare this approach with another recent approach by Bryce that computes probability estimates using Monte Carlo simulation of possible worlds in plan graphs.
Author
Correlation; Heuristic Methods; Probability Theory; Exclusion; Estimates

20060022526 Air Force Research Lab., Eglin AFB, FL USA
Dynamic Sensor Coverage
Jeffcoat, David; Tiwari, Abhishek; Jun, Myungsoo; Murray, Richard; Jun 23, 2005; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447996; No Copyright; Avail.: CASI: A03, Hardcopy

CONCLUSIONS: * What's new? A framework for the Dynamic Coverage problem. * Insightful: Results are intuitive and provide deeper insight. * Experiments: Infrastructure exists. * Scalability: the approach can be easily extended to multiple sensors and systems. FUTURE WORK: * Stability region in the coupled environment case. * Synthesis of the transition probability matrix for the Markov case. * Multiple sensor case. * Convergence to static coverage results as the number of sensors increases. * Experiments.
DTIC
Convergence; Transition Probabilities; Stability

20060022725 NASA Langley Research Center, Hampton, VA, USA
Field Penetration in a Rectangular Box Using Numerical Techniques: An Effort to Obtain Statistical Shielding Effectiveness
Bunting, Charles F.; Yu, Shih-Pin; IEEE Transactions on Electromagnetic Compatibility; [2006]; Vol. 46, No. 2, pp. 160-168; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC1-0132; Copyright; Avail.: Other Sources

This paper emphasizes the application of numerical methods to explore the ideas related to shielding effectiveness from a statistical view. An empty rectangular box is examined using a hybrid modal/moment method. The basic computational method is presented followed by the results for single- and multiple observation points within the over-moded empty structure. The statistics of the field are obtained by using frequency stirring, borrowed from the ideas connected with reverberation chamber techniques, and extends the ideas of shielding effectiveness well into the multiple resonance regions. The study presented in this paper will address the average shielding effectiveness over a broad spatial sample within the enclosure as the frequency is varied.
Author
Statistical Analysis; Numerical Analysis; Boxes (Containers); Electromagnetic Shielding

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20060021634 Liverpool Univ., UK
Adaptive Channel Estimation for Multiple-Input Multiple-Output Frequency Domain Equalization
Zhu, Xu; Malek, Fareq; Gong, Yi; Huang, Yi; Jan 2005; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447400; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447400; Avail.: Defense Technical Information Center (DTIC)

In this paper we investigate adaptive channel estimation for frequency domain equalization (FDE) in a single carrier (SC) multiple-input multiple-output (MIMO) system. Two types of channel estimation methods are proposed, assuming uncorrelated and correlated frequency bins. The FDE coefficients are computed using the channel estimates. It is shown that our proposed structures significantly outperform the adaptive FDE without channel estimation at high SNR. In particular, the

proposed LMS-SCE FDE approaches the performance of FDE with perfect channel state information (CSI), and has a fast convergence speed and reasonably low complexity.
DTIC
Frequencies; MIMO (Control Systems)

20060021700 Reaction Engineering International, Salt Lake City, UT USA
Detailed Computational Modeling of Military Incinerators
Denison, Martin K; Montgomery, Christopher J; Sarofim, Adel F; Bockelie, Mike J; Magee, Dick; Gouldin, Fred; McGill, Gene; Jan 2001; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-00-C-0061
Report No.(s): AD-A447764; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447764; Avail.: CASI: A02, Hard-copy

The USA has selected incineration as one of the methods for destroying the highly toxic chemical agents and munitions contained within the Chemical Weapons Stockpile. In this paper we describe a suite of Computational Fluid Dynamic (CFD) based models that provide the ability to conduct detailed simulations of chemical demilitarization incinerator operation. The models contain furnace and canister geometries and all of the relevant physics and chemistry. The destruction of chemical agent predicted using non-equilibrium chemistry models that include full and reduced chemical kinetic mechanisms. We have developed CFD models for a Liquid Incinerator, Metal Parts Furnace, Metal Parts Furnace Afterburner, and a De-Activation Furnace System located at the Tooele Chemical Agent Disposal Facility (TOCDF) in Tooele, Utah. We modeled the incineration of the GB agent using the simulant dimethyl methylphosphonate (DMMP). The models predict complete destruction of the chemical agent when the incinerators and afterburners are operated as per standard operating conditions.
DTIC
Afterburning; Chemical Warfare; Incinerators; Toxicity

20060021702 Naval Surface Warfare Center, Bethesda, MD USA
The National Shipbuilding Research Program, Proceedings of the REAPS Technical Symposium Paper No. 1: Ship Production Committee Panel Overviews
Oct 1980; 71 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447766; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447766; Avail.: CASI: A04, Hard-copy

The Research and Engineering for Automation and Productivity in Shipbuilding (REAPS) program aims at increasing U.S. shipyard productivity. The organization, activities and current and planned development projects of the program are reviewed. The 1980 symposium focuses on developing a consensus on a format for long range facility plans, with an emphasis on cost effectiveness and environmental impacts.
DTIC
Conferences; Marine Technology; Ships

20060021745 General Dynamics Advanced Information Systems, Colorado Springs, CO USA
Civil Position, Navigation, and Timing Analysis of Alternatives
Bloser, Richard; Dubois, Jeff; Jun 21, 2005; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447859; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447859; Avail.: CASI: A03, Hard-copy

PURPOSE: Provide an overview of the Civil Position, Navigation, and Timing Analysis of Alternatives conducted for the IGEB. This presentation will discuss the analysis methods used, scenario analysis, and some of the challenges encountered in applying a military style AoA to an analysis conducted within the civil community.
DTIC
Alternatives; Global Positioning System; Navigation; Time Measurement; Timing Devices

20060021747 Mitre Corp., Colorado Springs, CO USA
Space-Oriented Capabilities of SEAS for AFSPC
Reid, Mark D; Saenz, Lorien; Raquepas, Joseph; Solo, Christopher; Jun 23, 2005; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447862; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447862; Avail.: CASI: A03, Hard-copy

PURPOSE of STUDY: (1) Assess SEAS for its ability to address AFSPC's space-oriented analyses; (2) Discover, be aware of, and appreciate SEAS's strengths and weaknesses; (3) Understand to which questions and studies SEAS could be effectively applied: mission-level or campaign-level?
DTIC
Aerospace Systems; Computerized Simulation; Models; Seas; Systems Analysis

20060021758 Center for Army Analysis, Fort Belvoir, VA USA
Operation Iraqi Freedom 04 - 06: Opportunities to Apply Quantitative Methods to Intelligence Analysis
Hansen, Eric C; Jun 23, 2005; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447880; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447880; Avail.: CASI: A03, Hard-copy

The purpose of this presentation is to illustrate the need for a quantitative analytical capability within organizations and staffs that provide intelligence analysis to Army, Joint, and Coalition Force headquarters. The author presents a brief history of intelligence analysis in World War I, World War II, the Cold War, and the post-Cold War era. Today's threat is nondoctrinal and asymmetric. The means used to counter this threat are based on standardized equipment and capabilities, and they rely on template-based analysis and network diagrams. Template-based analysis works well with doctrinally dependent threats, but it is of limited used against asymmetric threats. The author presents a chart showing the information flow of intelligence in Multi-National Corps - Iraq (MNC-I). What worked in Iraq were single data bases, speed, granularity, trend analysis, ANOVA methods, network flow analysis, geospatial products, correlation/causality, and statistical process control charts. What didn't work were multiple data bases, a push for 100% accuracy, too much granularity, and low R(exp 2) values. The author presents examples of MNC-I intelligence products. A bar chart shows the average weekly attacks by category and time period for the period 1 Jan 2004 to 28 Jan 2005. The chart presents types of attacks during baseline, pre-sovereignty, sovereignty, and election periods. Two other charts show attack times by hour and attacks by MSC for the period 18 Dec 2004 to 28 Jan 2005. These attacks are classified as attacks on IGO, Infrastructure, ISF, Civilians, and MNF-I. A map product shows the density of attacks. In summary, changing threats prompt the development of additional intelligence analysis tools; history has proven that quantitative methods provide value-added to intelligence analysis; quantitative analysis compliments, but does not replace, automated solutions; and quantitative methods can give a high potential payoff with minor resourcing requirements.
DTIC
Intelligence; Quantitative Analysis; Warfare

20060021759 Northrop Grumman Information Technology, Inc., Colorado Springs, CO USA
The Analytical Process Used to Develop Military Utility-Based Architectures for the Air Force Space Command's Integrated Planning Process
Tindle, John R; Stivers, Joyce; Mellott, Danny L; Jun 23, 2005; 26 pp.; In English
Report No.(s): AD-A447882; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447882; Avail.: CASI: A03, Hard-copy

IPP DEFINED: (1) An iterative process to evaluate and refine the objectives and tasks of assigned Air Force Mission Areas and functions; (2) Identifies deficiencies in mission and functional areas caused by changes in national military strategy, global political-military threats, and fiscal constraints; (3) The foundation for requirements generation and the acquisition process; (4) Conducted in four stages: Mission Area Assessment (MAA); Mission Needs Analysis (MNA); Mission Solutions Analysis (MSA); Integrated Investment Analysis (IIA); (5) Relies heavily on modeling and simulation (M&S) to evaluate operational support tasks that support a military strategy and objective.
DTIC
Computerized Simulation; Military Operations; Models; Planning; Software Development Tools

20060021760 Air Force Studies and Analyses Agency, Washington, DC USA
Air Force Warfighting Headquarters (WFHQs) and Combat Analyst Update
Koewler, David; Jun 23, 2005; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447883; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447883; Avail.: CASI: A03, Hard-copy

The COMBAT ANALYST OFFICER (CAO) uses quantitative and qualitative problem solving expertise to provide quick turn-around analysis for operational questions and problems. Assesses current operations to find trends and indicators that provide the decision makers with critical insights to determine and mold future operations. Familiar with Air Operations

Center (AOC) processes and the spectrum of Air Force Operations. Expert in operations assessment techniques and tools. The SENIOR COMBAT ANALYST (SCA) provides the leadership for a combat analyst team an/or is the interface with theater level or other senior-level staff for quantitative and qualitative operations assessments. Experienced in analyzing a wide range of Air Force and joint operations. Can operate within the Air Operation Center (AOC), Combined Joint Task Force (CJTF), or other operational organizations. Knowledgeable on the application of combat operations and directs the efforts of supporting combat analyst. The DIRECTOR COMBAT ANALYSES (DCA) provides the leadership for a combat analyst team and/or is the interface with theater level or other senior-level staff for quantitative and qualitative operations assessments. Experienced in analyzing a wide range of Air Force, joint, and combined operations. Interfaces with the CJTF staff, CJFACC, COMAFFOR, the AOC director, and/or other senior-level staff regarding assessment and analysis matters.
DTIC
Armed Forces (United States); Combat; Operations Research

20060021799 Mitre Corp., Colorado Springs, CO USA
Architectures for Decision Analysis
Pleimann, Mark E; McCandless, Dru; Kane, Robyn; Kerchner, Phil; Jun 23, 2005; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447861; No Copyright; Avail.: CASI: A03, Hardcopy

SUMMARY: Creating and using an ontology focused on warfighter capabilities and integrated multi-discipline methodologies can provide continuity throughout an enterprise to facilitate more informed decision making.
DTIC
Decision Making; Decision Support Systems; Decision Theory

20060021808 Army Test and Evaluation Command, Alexandria, VA USA
Synthetic Jammer in Seamless and Interactive Environments: A Study and Demonstration
Jodoin, Richard; Kelley, Paul D; Tornquist, Emanuel M; Jun 23, 2005; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447902; No Copyright; Avail.: CASI: A03, Hardcopy

U.S. Army Test and Evaluation (T&E) is facing several complex and challenging issues: UNREALISTIC THREAT ENVIRONMENT -- Current threat representations do not provide a dynamic and free thinking threat that can act against and react to Blue systems and forces under test, especially in the key areas of Electronic Warfare (EW) and Information Operations (IO). DISCONNECT ACROSS SIMULATION DOMAINS -- No approach currently exists to support a realistic threat environment within the constructive domain that will adequately augment the live and virtual components of T&E. REAL TIME CASUALTY ASSESSMENT (RTCA) -- Current RTCA models and systems do not support real-time or near real-time feedback and assessment of Blue and threat force dynamic interchanges during T&E. RANGE RESTRICTIONS -- Many DoD test ranges preclude open air RF jamming; federal restrictions such as safety issues with regard to GPS jamming. RESOURCE CHALLENGES -- Availability of military units to participate in test events; simply can't fit a Unit of Action (UofA) or Unit of Employment (UofE) on existing test ranges. BECAUSE the live, virtual, and constructive arenas continue to merge into a cohesive environment for the support of testing and training, it is critical that threat realism, as related to EW and IO, is able to transition across all three. THERE EXISTS AN IMMEDIATE NEED for Electronic Attack (EA) models which support EW within the constructive testing environment and which will augment the live and virtual components of T&E; AND we need to integrate this capability in a manner that provides seamless interoperability across the simulation domains.
DTIC
Electronic Warfare; Jammers; Jamming; Threat Evaluation; Warfare

20060021834 Maryland Univ., College Park, MD USA
Interactive Planning under Uncertainty with Casual Modeling and Analysis
Kuter, Ugur; Nau, Dana; Lemmer, John F; Jan 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447944; No Copyright; Avail.: CASI: A02, Hardcopy

This paper describes a new technique for interactive planning under conditions of uncertainty. Our approach is based on the use of the Air Force Research Laboratory's Causal Analysis Tool (CAT), a system for creating and analyzing causal models similar to Bayes networks. In order to use CAT as a tool for planning, users go through an iterative process in which they use CAT to create and analyze alternative plans. One of the biggest difficulties is that the number of possible plans is exponential. In any planning problem of significant size, it is impossible for the user to create and analyze every possible plan; thus users can spend days arguing about which actions to include in their plans. To solve this problem, we have developed a way to

quickly compute the minimum and maximum probabilities of success associated with a partial plan, and use these probabilities to recommend which actions the user should include in the plan in order to get the plan that has the highest probability of success. This provides an exponential reduction in amount of time needed to find the best plan.
DTIC
Planning; Software Development Tools

20060021837 Maryland Univ., College Park, MD USA
The Effect of Bilingual Term List Size on Dictionary-Based Cross-Language Information Retrieval
Demner-Fushman, Dina; Oard, Douglas W; Jan 2006; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447948; No Copyright; Avail.: CASI: A03, Hardcopy

Bilingual term lists are extensively used as a resource for dictionary-based Cross-Language Information Retrieval (CLIR), in which the goal is to find documents written in one natural language based on queries that are expressed in another. This paper identifies eight types of terms that affect retrieval effectiveness in CLIR applications through their coverage by general-purpose bilingual term lists, and reports results from an experimental evaluation of the coverage of 35 bilingual term lists in news retrieval application. Retrieval effectiveness was found to be strongly influenced by term list size for lists that contain between 3,000 and 30,000 unique terms per language. Supplemental techniques for named entity translation were found to be useful with even the largest lexicons. The contribution of named entity translation was evaluated in a cross-language experiment involving English and Chinese. Smaller effects were observed from deficiencies in the coverage of domain specific terminology when searching news stories.
DTIC
Cross Correlation; Dictionaries; Information Retrieval

20060021839 Naval Postgraduate School, Monterey, CA USA
The Salvo Equations: Test and Applications
Hughes, Jr, Wayne P; Jun 23, 2005; 23 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447950; No Copyright; Avail.: CASI: A03, Hardcopy

Presentation on 'The Salvo Equations: Tests and Applications.' Order of presentation is: The Salvo Equations; Value of Analytical Models; V & V [&A?]; Recent Contributions to Understanding; Recent Influence.
DTIC
Navy; Operations Research; Warfare

20060021843 Naval Surface Warfare Center, Panama City, FL USA
Optimal Resource Allocation and Multi-Dimensional MCM Theory
Hyland, John C; Smith, Cheryl M; Jun 23, 2005; 41 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447955; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Presentation on optimal resource allocation and multi-dimensional MCM theory.
DTIC
Planning; Resource Allocation; Warfare

20060021873 Army Research Lab., Adelphi, MD USA
Joint Application Mapping/Interconnect Synthesis Techniques for Embedded Chip-Scale Multiprocessors
Bambha, Neal K; Bhattacharyya, Shuvra S; Feb 2005; 15 pp.; In English
Contract(s)/Grant(s): MDA972-00-1-0023
Report No.(s): AD-A448007; No Copyright; Avail.: CASI: A03, Hardcopy

As transistor sizes shrink, interconnects represent an increasing bottleneck for chip designers. Several groups are developing new interconnection methods and system architectures to cope with this trend. New architectures require new methods for high-level application mapping and hardware/software codesign. In this paper, we present high-level scheduling and interconnect topology synthesis techniques for embedded multiprocessor systems-on-chip that are streamlined for one or more digital signal processing applications. That is, we seek to synthesize an application-specific interconnect topology. We show that flexible interconnect topologies utilizing low-hop communication between processors offer advantages for reduced power and latency. We show that existing multiprocessor scheduling algorithms can deadlock if the topology graph is not strongly connected, or if a constraint is imposed on the maximum number of hops allowed for communication. We detail an efficient algorithm that can be used in conjunction with existing scheduling algorithms for avoiding this deadlock. We show

that it is advantageous to perform application scheduling and interconnect synthesis jointly, and present a probabilistic scheduling/interconnect algorithm that utilizes graph isomorphism to pare the design space.
DTIC
Chips; Embedding; Multiprocessing (Computers)

20060021902 Air Force Studies and Analyses Agency, Washington, DC USA
AF Operations Analyst (OA) Force Development Initiatives
Oyler, Roxann; Jun 23, 2005; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A448089; No Copyright; Avail.: CASI: A03, Hardcopy

CAREER FIELD MGT CHALLENGES: * Identifying core OA members * Instilling core identity among OAs * Identifying/tracking OA experience, education & training * Matching position requirements to analyst capabilities * Determining OA functional training requirements * Understanding operators/analysts capabilities * Developing a career development path * Identifying qualified personnel for career broadening * Integrating OAs into operational teams * Overcoming field grade OA manning shortage * Growing requirements.
DTIC
Military Operations; Occupation

20060021951 Minnesota Univ., Minneapolis, MN USA
Capacity Constrained Routing Algorithms for Evacuation Route Planning
Lu, Qingsong; George, Betsy; Shekhar, Shashi; May 4, 2006; 37 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-2-0014
Report No.(s): AD-A447888; TR-06-017; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447888; Avail.: CASI: A03, Hardcopy

Evacuation route planning identifies paths in a given transportation network to minimize the time needed to move vulnerable populations to safe destinations. Evacuation route planning is critical for numerous important applications like disaster emergency management and homeland defense preparation. It is computationally challenging because the number of evacuees often far exceeds the capacity, i.e. the number of people that can move along the road segments in a unit time. Linear Programming(LP) based methods using time expanded networks can take hours to days of computation for metropolitan sized problems. In this paper, we propose a new approach, namely a capacity constrained routing planner which models capacity as a time series and generalizes shortest path algorithms to incorporate capacity constraints. We characterize the design space for reducing the computational cost. Analytical cost model and experiment results show that the proposed algorithm is faster than the LP based algorithms and requires less memory. Experimental evaluation using various network configurations also shows that the proposed algorithm produces solutions that are comparable to those produced by LP based algorithms while significantly reducing the computational cost.
DTIC
Algorithms; Planning; Routes; Time Series Analysis

20060021996 Army Pacific APO, San Francisco, CA USA
Opportunities and Challenges of Military Police Use of Remote Tactical Sensors and Advanced Sensor Systems
Stephens, William R; Jun 23, 2005; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447903; No Copyright; Avail.: CASI: A03, Hardcopy

HISTORICAL: Relationship with Combat Arms -- Relationship with Intelligence Services: 1970's training * MP training * Combined arms training. Relationships Change Radically in the 1980's and 1990's: Panama * Somalia * Haiti * Balkans * Desert Storm and Desert Shield. Late 1990's: Explosion in intelligence and information management tools * Emergence of new and redefined intelligence disciplines * Expansion of collection management. Post 9/11/2001 - Extension of all military branches. Change in Focus: Less policing the force * More (much more) interaction with belligerents and civilian nationals. Not just a Force Multiplier -- A Force Component.
DTIC
Intelligence; Police; Remote Sensors

20060022168 NASA Ames Research Center, Moffett Field, CA, USA
Agent Reward Shaping for Alleviating Traffic Congestion
Tumer, Kagan; Agogino, Adrian; [2006]; 6 pp.; In English; AAMAS'06, 8-12 May 2006, Hokkaido, Japan; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Traffic congestion problems provide a unique environment to study how multi-agent systems promote desired system level behavior. What is particularly interesting in this class of problems is that no individual action is intrinsically 'bad' for the system but that combinations of actions among agents lead to undesirable outcomes, As a consequence, agents need to learn how to coordinate their actions with those of other agents, rather than learn a particular set of 'good' actions. This problem is ubiquitous in various traffic problems, including selecting departure times for commuters, routes for airlines, and paths for data routers. In this paper we present a multi-agent approach to two traffic problems, where far each driver, an agent selects the most suitable action using reinforcement learning. The agent rewards are based on concepts from collectives and aim to provide the agents with rewards that are both easy to learn and that if learned, lead to good system level behavior. In the first problem, we study how agents learn the best departure times of drivers in a daily commuting environment and how following those departure times alleviates congestion. In the second problem, we study how agents learn to select desirable routes to improve traffic flow and minimize delays for. all drivers.. In both sets of experiments,. agents using collective-based rewards produced near optimal performance (93-96% of optimal) whereas agents using system rewards (63-68%) barely outperformed random action selection (62-64%) and agents using local rewards (48-72%) performed worse than random in some instances.
Author
Traffic; Congestion; Air Traffic Control; Routes; Airline Operations

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20060021576 Black River Systems Co., Inc., Utica, NY USA
WIPL-D Parallelization Effort
Card, Christopher; Jan 2005; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447410; No Copyright; Avail.: CASI: A01, Hardcopy

This paper presents the results of the final year of a development effort to provide a scalable, portable, parallel scene generation tool that provides the capability to rapidly generate scenes of radiating and scattering structures in realistically complex electromagnetic environments. The benefit of such a tool is that it will provide users with the capability to solve large problems that cannot be currently solved with existing sequential electromagnetic modeling tools. This tool supports a broad range of users including researchers, algorithm developers, analysts, and system developers. This paper will present the parallelization process and will show the final results of the project. The project presented here is the parallelization of WIPL-D, an electromagnetic modeling tool, which picks up in time from where [1] left off. Through parallelization, the well known and commercially available tool became faster and now possesses increased capabilities. This paper will walk you through the parallelization process, providing the strategies used and the results received.
DTIC
Scene Generation; Scattering; Software Development Tools

20060021662 Battelle, Dayton, OH USA
Turbine Engine Research Center (TERC) Data System Enhancement and Test Article Evaluation. Delivery Order 0002: TERC Aeromechanical Characterization
Teets, Pamela S; O'brien, Walter; Capece, Vince; Tan, Choon; Jun 2005; 375 pp.; In English
Contract(s)/Grant(s): F33615-02-D-2223-0002; Proj-3066
Report No.(s): AD-A447707; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447707; Avail.: CASI: A16, Hard-copy

Battelle has supported the Air Force Compressor Research Facility from May 13, 2003 through June 30, 2005 under this Delivery Order. Under this Delivery Order, aeromechanical characterization research was performed in conjunction with testing performed in the Turbine Engine Research Center (TERC). This research involved data analysis to identify new behavior, verify codes and model simulating aeromechanical behavior, and perform aeromechanical test and evaluation of hardware undergoing testing in the TERC. This work was in direct support of the national High-Cycle Fatigue (HCF) program under Integrated High-Performance Turbine Engine Technology (IHPTET).
DTIC
Aerodynamic Loads; Augmentation; Characterization; Computational Fluid Dynamics; Data Systems; Evaluation; Finite Element Method; Models; System Effectiveness; Turbine Engines; Turbines

20060021741 YKK Corp., Toyama, Japan

Numerical Analysis of Flow Around Rectangular Cylinders with Various Side Ratios

Rokugou, Akira; Okajima, Atsushi; Kamiyama, Kohji; Apr 14, 2005; 9 pp.; In English; Original contains color illustrations Report No.(s): AD-A447854; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447854; Avail.: CASI: A02, Hard-copy

Three-dimensional numerical analysis of the flow around rectangular cylinders with various side ratios, D/H, from 0.2 to 2.0, was carried out for Reynolds number of 1000 by using a multi directional finite difference method on a regular-arranged multi grid. The predicted results are in good agreement with the experimental data. It is found that fluid dynamic characteristics of rectangular cylinders alternate between the high-pressure mode and the low-pressure mode of the base pressure for D/H=02-0.6. We show that this phenomenon is induced by the change of the flow pattern around rectangular cylinders.

DTIC

Fluid Dynamics; Numerical Analysis; Separated Flow

20060021944 Helsinki Univ., Helsinki, Finland

Asymptotical Behaviour of a Semilinear Diffusion Equation

Annales Academie Scientiarum Fennicae: Mathematica; 2006; ISSN 1239-6303; Volume 148; 64 pp.; In English; To be presented, with the permission of the Faculty of Science of the University of Joensuu, for public criticism at the University, on June 9, 2006; Copyright; Avail.: Other Sources

The diffusion equation, also known as the heat equation, describes the evolution in time and space of some physical quantities, such as heat or chemical concentration. Unfortunately, in many physical cases, diffusion does not comply with the linear model, and thus a study of the more difficult nonlinear diffusion equation is relevant. Obtaining a closed form solution in the nonlinear case seems often hopeless, and thus we can only try to determine some qualitative properties of the solution. The spatial dimension, the degree of nonlinearity and the smallness of the initial data affect the global existence or the blowing up of the solution of the Cauchy problem. Fujita [3] proved under some restriction that for integrable initial data the degree of nonlinearity must be greater than some spatial dimension dependence constant in order for a global solution to exist. The existence of the solution is a good starting point for a study, but usually we also want to know how fast diffusion happens or even how nonlinearity affects the solution. Bricmont, Kupiainen and Lin [I] showed, using the renormalization group method, that for long times the nonlinear term has almost no effect. Similar results without the renormaliiation group method were obtained, for instance, by Zhao [ll] and Taskinen [10]. Taskinen also managed to find a concrete representation for the leading term of the solution. However, most results arise from the integrable initial data or the initial data is assumed to be real and non-negative. In this thesis, we consider the classical semilinear diffusion equation and the associated Cauchy problem. Our initial data may sometimes be also nonintegrable. We start by introducing basic notations and some known results in Section 1. The rest of the paper can be divided into three parts. Firstly, in Sections 2 and 3 we study the existence and upper bound of the solution for the non-integrable initial data. We find an interesting connection between smallness of initial data, order of nonlinearity and dimension. We also notice what kind of effect the non-integrable initial data has to the rate of diffusion. Secondly, when the initial data is anisotropic and integrable in some direction but not in others, the initial state seems pretty complicated but the diffusion rate is surprisingly easy to determine. We consider this kind of situation in Section 4. Finally, the main result of this thesis is presented in Sections 5-7. There we study the anisotropic case in R2 and determine a leading term of the solution (Theorem 5.1). In the leading term we find an interesting analogy between the cases of integrable and non-integrable initial data.

Author

Diffusion; Nonlinear Equations; Asymptotes; Thermodynamics

70
PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics*.

20060021643 Universitaet der Bundeswehr Muenchen, Neubiberg, Germany

Approximate Natural Frequencies of Circular Plates with Mixed Boundary Conditions

Bauer, Helmut F; Eidel, Werner; Feb 11, 2004; 43 pp.; In English; In English; In German

Report No.(s): AD-A447668; LRT-WE-9-FB-1; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447668; Avail.: CASI: A03, Hardcopy

The lower frequencies of a circular plate with mixed boundary conditions have been determined. For a plate, which boundary is partly clamped and partly simply supported the course of the axisymmetric lower natural frequencies have been investigated. In addition the natural frequencies of plates in asymmetric motion axe presented and exhibit for each modem #0 two oscillation branches with quite different angular modal lines.
DTIC

Boundary Conditions; Circular Plates; Resonant Frequencies

20060021754 Library of Congress, Washington, DC USA

High Altitude Electromagnetic Pulse (HEMP) and High Power Microwave (HPM) Devices: Threat Assessments

Wilson, Clay; Apr 14, 2006; 21 pp.; In English

Report No.(s): AD-A447874; CRS-RL32544; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447874; Avail.: CASI: A03, Hardcopy

Electromagnetic Pulse (EMP) is an instantaneous, intense energy field that can disrupt at a distance numerous electrical systems and high technology microcircuits that are especially sensitive to power surges. A large-scale EMP effect can be produced by a single nuclear explosion detonated high in the atmosphere. This method is referred to as High-Altitude EMP (HEMP). A similar, smaller scale EMP effect can be created using non-nuclear devices with powerful batteries or reactive chemicals. This method is called High Power Microwave (HPM). Several nations, including sponsors of terrorism, may currently have a capability to use EMP as a weapon for cyberterrorism to disrupt communications and other parts of the U.S. critical infrastructure. Some equipment and weapons used by the U.S. military may be vulnerable to the effects of EMP. The threat of an EMP attack against the USA is hard to assess, but some observers indicate that it is growing along with worldwide access to newer technologies and the proliferation of nuclear weapons. In the past, the threat of mutually assured destruction provided a deterrent against the exchange of multiple high-yield nuclear warheads. But now even a single, specially designed low-yield nuclear explosion high above the USA, or over a battlefield, can produce a large-scale EMP effect that could result in a widespread loss of electronics, but no direct deaths, and may not necessarily evoke a large nuclear retaliatory strike by the U.S. military. This, coupled with the possible vulnerability of U.S. commercial electronics and U.S. military battlefield equipment to the effects of EMP, may create a new incentive for other countries to develop or acquire a nuclear capability. What is the USA doing to protect civilian critical infrastructure systems against the threat of EMP, and how does the vulnerability of U.S. civilian and military electronics to EMP attack encourage other nations to acquire nuclear weapons?
DTIC

Civil Defense; Electromagnetic Pulses; High Altitude; Microwaves; Policies; Threat Evaluation

20060021950 McDonnell-Douglas Corp., Long Beach, CA USA

Matrix Methods of Aerospace Structural Analysis. Invited Paper

Denke, Paul H; Oct 1968; 66 pp.; In English

Report No.(s): AD-A447800; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447800; Avail.: CASI: A04, Hardcopy

The future development of key areas in the field of matrix structural analysis is considered. The relationship of these areas to the overall design problem is established, and sources of past difficulties within the areas are identified. Avenues of approach to the difficulties are suggested and illustrated by reference to recently conducted research. In the area of modelling, the triangular membrane element and the bar-panel idealization are evaluated. A method of improving results obtained from the analysis of models composed of triangular membrane elements is presented. The loss of numerical accuracy in linear structural analysis is considered and methods of improving accuracy are described. Problems in the field of nonlinear structural analysis are reviewed. The possibility of an interactive computational approach to the synthesis of complex structures is suggested, and an interactive graphics approach to the synthesis of a structure subjected to steady-state vibration is demonstrated.
DTIC

Aerospace Systems; Matrix Methods; Structural Analysis

20060021953 Wales Univ., Swansea, UK

Curved Thick Shell and Membrane Elements with Particular Reference to Axisymmetric Problems

Ahmad, Sohrabuddin; Irons, Bruce M; Zienkiewicz, Olgierd C; Oct 1968; 35 pp.; In English

Report No.(s): AD-A447743; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447743; Avail.: CASI: A03, Hardcopy

General curved isoparametric elements in two and three dimensions are degenerated to deal with axi-symmetric and arbitrary shells. By introducing only some of the usual Navier assumptions, these new shell elements can include shear as well as bending deformations. It is shown that, even for very thick shells, excellent accuracy is retained. By further degeneration membrane situations are dealt with.
DTIC
Membrane Structures; Membranes; Symmetry; Thin Walled Shells

20060021955 Massachusetts Inst. of Tech., Cambridge, MA USA
Rationalization in Deriving Element Stiffness Matrix by Assumed Stress Approach
Plan, Theodore H; Tong, Pin; Oct 1968; 30 pp.; In English
Contract(s)/Grant(s): F44620-67-C-0019
Report No.(s): AD-A447742; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447742; Avail.: CASI: A03, Hard-copy

From the principle of minimum complementary energy, which is extended to take into account the possible discontinuity in stresses or displacements along the interelement boundaries, the finite element methods by both the assumed stress hybrid model and the equilibrium model can be formulated. This formulation enables the development of a rational method for consistent lumping of body and surface forces and the establishment of a criterion for the kinematical instability of a system. For the hybrid model, there is an optimum choice of the number of stress modes for a given boundary displacement approximation. Example calculations for plate-bending problems are included to substantiate the analytical predictions. Examples are also carried out to illustrate the convenience in taking transverse shear effects into account by the hybrid method.
DTIC
Rational Functions; Stiffness; Stiffness Matrix

20060021958 California Univ., Berkeley, CA USA
A Refined Quadrilateral Element for Analysis of Plate Bending
Clough, Ray W; Felippa, Carlos A; Oct 1968; 43 pp.; In English
Report No.(s): AD-A447741; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447741; Avail.: CASI: A03, Hard-copy

The formulation of a fully compatible general quadrilateral plate bending element is described. The element is assembled from four partially constrained linear curvature compatible triangles, arranged so that no mid-side nodes occur on the external edges of the quadrilateral; thus, the resulting element has only 12 degrees of freedom. Also described is a simple shear distortion mechanism which may be incorporated into the element without changing its basic structure. Results are presented for static analyses with and without shear distortion, and for plate vibration and plate buckling studies, all performed with this quadrilateral element. It is concluded that this is the most efficient general bending element yet devised.
DTIC
Bending; Quadratic Equations; Refining

20060021962 Technische Hochschule, Stuttgart, Germany
Some New Elements for the Matrix Displacement Method
Argyris, J H; Buck, K E; Scharpf, D W; Hilber, H M; Mareczek, G; Oct 1968; 66 pp.; In English
Report No.(s): AD-A447740; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447740; Avail.: CASI: A04, Hard-copy

This paper presents a summary of some of the progress in the application of finite element methods to problems of continuum and structural mechanics. Since space was limited, we could not reproduce the theory and applications of an extensive class of new equilibrium elements, and had to restrict the review to pure kinematic models (matrix displacement method). Moreover, in this latter field we can only give a limited survey of the work carried out at the Institute of Statics and Dynamics and the Department of Aeronautical Structures at Imperial College. With few exceptions, we have ignored the basic theory and have reproduced only some characteristic results. Broadly, the research presented here covers the following fields: (a) Application of more refined elements to three-dimensional stress and strain fields; (reference to the corresponding two-dimensional developments are not made); (b) Application of two highly efficient classes of fully compatible plate elements; (c) A new class of elements for shells of arbitrary geometry; (d) A generalization and refinement of the analysis of elasto-plastic deformations, including a new iterative method. Here too, we had to omit a discussion of the kinematic

hardening effect; (e) Some techniques for the analysis of large displacements and strains.
DTIC
Displacement; Finite Element Method; Matrix Methods; Structural Analysis

20060021989 Lawrence Livermore National Lab., Livermore, CA USA
Effective Interactions and Operators in Nuclei within the No-Core Shell Model
Barrett, B. R.; Navratil, P.; Stetcu, I.; Vary, J. P.; Sep. 16, 2005; 12 pp.; In English
Report No.(s): DE2006-875649; UCRL-PROC-215415; No Copyright; Avail.: Department of Energy Information Bridge

We review the application of effective operator formalism to the ab initio no core shell model (NCSM). For short-range operators, such as the nucleon-nucleon potential, the unitary-transformation method works extremely well at the two-body cluster approximation and good results are obtained for the binding energies and excitation spectra of light nuclei (A lesser than or equal to 16). However, for long-range operators, such as the radius or the quadrupole moment, performing this unitary transformation at the two-body cluster level, does not include the higher-order correlations needed to renormalize these long-range operators adequately. Usually, such correlations can be obtained either by increasing the order of the cluster approximation, or by increasing the model space. We will discuss the difficulties of these approaches as well as alternate possible solutions for including higher-order correlations in small model spaces.
NTIS
Nuclear Binding Energy; Nucleon-Nucleon Interactions

20060021990 Sandia National Labs., Albuquerque, NM USA
Turbulence Model for Buoyant Flows Based on Vorticity Generation
Nicolette, V. F.; Tieszen, S. R.; Black, A. R.; Domino, S. P.; O'Hern, T. J.; Oct. 2005; 42 pp.; In English
Report No.(s): DE2006-875637; SAND2005-6273; No Copyright; Avail.: National Technical Information Service (NTIS)

A turbulence model for buoyant flows has been developed in the context of a k-(var-epsilon) turbulence modeling approach. A production term is added to the turbulent kinetic energy equation based on dimensional reasoning using an appropriate time scale for buoyancy-induced turbulence taken from the vorticity conservation equation. The resulting turbulence model is calibrated against far field helium-air spread rate data, and validated with near source, strongly buoyant helium plume data sets. This model is more numerically stable and gives better predictions over a much broader range of mesh densities than the standard k-(var-epsilon) model for these strongly buoyant flows.
NTIS
Buoyancy; Turbulence Models; Vortices; Vorticity

20060021993 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Baryon Number and Strangeness: Signals of a Deconfined Antecedent
Majumder, A.; Koch, V.; Randrup, J.; January 2005; 14 pp.; In English
Report No.(s): DE2006-875748; No Copyright; Avail.: National Technical Information Service (NTIS)

The correlation between baryon number and strangeness is used to discern the nature of the deconfined matter produced at vanishing chemical potential in high-energy nuclear collisions at the BNL RHIC. Comparisons of results of various phenomenological models with correlations extracted from lattice QCD calculations suggest that a quasi-particle picture applies. At finite baryon densities, such as those encountered at the CERN SPS, it is demonstrated that the presence of a first-order phase transition and the accompanying development of spinodal decomposition would significantly enhance the number of strangeness carriers and the associated fluctuations.
NTIS
Baryons; Strangeness

20060021998 National Aeronautical Establishment, Ottawa, Ontario Canada
Vibration Analysis of Cantilevered Curved Plates Using a New Cylindrical Shell Finite Element
Olson, Mervyn D; Lindberg, Garry M; Oct 1968; 24 pp.; In English
Report No.(s): AD-A447803; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447803; Avail.: CASI: A03, Hard-copy

The stiffness and mass matrices for a relatively simple finite cylindrical shell element are presented. The element has 28 degrees of freedom corresponding to the seven generalized coordinates at each corner. All six rigid body modes for the element are adequately represented by this model. The element is used to predict the vibrations of a curved fan blade, and the results

are verified experimentally. It is found that a 4 x 4 grid of the finite elements is sufficient to predict the first twelve vibration frequencies for the fan blade to within ten percent. The agreement between experimental and theoretical mode shapes is generally very good.
DTIC
Cylindrical Shells; Dynamic Structural Analysis; Finite Element Method; Vibration

20060021999 Lawrence Livermore National Lab., Livermore, CA USA
Source and Background Gamma-ray Spectra
Gronberg, J.; Johnson, S.; Lange, D.; Wright, D.; Oct. 24, 2005; 12 pp.; In English
Report No.(s): DE2006-875640; UCRL-TR-216487; No Copyright; Avail.: Department of Energy Information Bridge

For this study, we have made spectra and integral count rate estimates for a trivial detector configuration with a variety of unclassified gamma-ray sources. The source/background spectra and absolute flux are taken from cumulative distribution files created from MCNP simulations prepared by Ron Wurtz and Mike Frank. The simulated objects were criticality assemblies (test setups to develop benchmarks for establishing safety margins in handling fissile material) taken from the International Handbook of Evaluated Criticality Safety Benchmark Experiments (Nuclear Energy Agency, 2001). These objects were placed inside a 30 cm box with packing material that corresponds to roughly 0.5 radiation lengths (X(sub 0)). The simulations were repeated with an additional 7cm thick steel box enclosure.
NTIS
Gamma Ray Spectra; Gamma Rays; Safety

20060022001 Lawrence Livermore National Lab., Livermore, CA USA
Level Densities of Iron Isotopes and Lower-Energy Enhancement of (gamma)-strentgh Function
Voinov, A. V.; Grimes, S. M.; Agvaanluvsan, U.; Algin, E.; Belgya, T.; Sep. 15, 2005; 12 pp.; In English
Report No.(s): DE2006-875643; UCRL-PROC-215395; No Copyright; Avail.: Department of Energy Information Bridge

The neutron spectrum from the (sup 55)Mn(d,n)(sup 56)Fe reaction has been measured at E(sub d) = 7 MeV. The level density of (sup 56)Fe obtained from neutron evaporation spectrum has been compared to the level density from Oslo-type (sup 57)Fe((sup 3)He, a(gamma))(sup 56)Fe experiment. The good agreement supports the recent results including an availability of a low-energy enhancement in the (gamma)-strength function for iron isotopes. The new level density function allowed us to investigate an excitation energy dependence of this enhancement, which is shown to increase with increasing excitation energy.
NTIS
Augmentation; Energy Levels; Iron Isotopes

20060022002 Lawrence Livermore National Lab., Livermore, CA USA, Los Alamos National Lab., NM USA
Search for Pentaquarks
Hartouni, E. P.; Sep. 08, 2005; 42 pp.; In English
Report No.(s): DE2006-875646; UCRL-CONF-215167; No Copyright; Avail.: National Technical Information Service (NTIS)

Recently observed hadrons that do not fit into the ''normal'' spectroscopic order should have been produced in old experiments. Are these claims supported by the legacy data. Fermilab Experiment 690 collected a 5 x 10(sup 9) event sample of p+p(yields) p(sub f)+X events at a beam momentum of 800 GeV/c ((radical)s = 38.8 GeV) at Lab G in the Neutrino-East beam line in the Tevatron 1991 fixed target run. The detector was an open geometry magnetic spectrometer with large geometric acceptance and extremely good momentum resolution.
NTIS
Neutrino Beams; Quarks

20060022003 Lawrence Livermore National Lab., Livermore, CA USA
High-Brightness Milestone Report to DOE OFES, FY05 Q4
Molvik, A. W.; Sep. 16, 2005; 18 pp.; In English
Report No.(s): DE2006-875648; UCRL-TR-215428; No Copyright; Avail.: National Technical Information Service (NTIS)

We have met this milestone by making measurements of electrons, as described in our FY05 Q3 Milestone Report, and simulating the same conditions with the WARP/POSINST code. This code has been developed over the last three years, by adding self-consistent electron and gas populations to the beam-dynamics particle-in-cell code, WARP, and combining it with

the electron-cloud code from LBNL, POSINST. This code development effort has advanced to the point where almost all elements of a comprehensive 'roadmap' are available. The WARP simulations shown here replicate experimental results, with agreement ranging from semi-quantitative agreement to close quantitative agreement.
NTIS
Brightness; Electron Gas; Electrons

20060022536
Optimization of Structures Based on the Study of Energy Distribution
Venkayya, V B; Khot, N S; Reddy, V S; Oct 1968; 44 pp.; In English
Report No.(s): AD-A447802; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447802; Avail.: CASI: A03, Hard-copy

An automated procedure is presented for minimum weight design of structures. It is an iterative procedure in which the design for the next cycle is determined by the study of the strain energy distribution in the present cycle. Displacement method of analysis is used in developing the method. Any other method of analysis which has the capability to determine strain energy in various parts of the structure should be applicable. Designs in the presence of stress constraints, and stress and displacement constraints are also considered. Where there are only stress constraints, a simple iteration based on the study of energy distribution is adequate. In the presence of displacement constraints, the design is carried in two stages. The first stage of iteration is similar to that in stress constraint problems and the second stage is based on a search procedure. Examples of two and three dimensional bar structures are presented to illustrate the effectiveness of the method. It proved to be extremely efficient in arriving at minimum weight structures.
DTIC
Optimization; Stress Analysis; Strain Distribution; Planar Structures

20060022627 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Niobium Thin Film Coating on a 500-MHz Copper Cavity by Plasma Deposition
Wang, H.; Wu, G.; Phillips, H. L.; Rimmer, P. A.; Valente, A. M.; January 2005; 8 pp.; In English
Report No.(s): DE2006-876074; No Copyright; Avail.: Department of Energy Information Bridge

A system using an Electron Cyclotron Resonance (ECR) plasma source for the deposition of a thin niobium film inside a copper cavity for superconducting accelerator applications has been designed and is being constructed. The system uses a 500-MHz copper cavity as both substrate and vacuum chamber. The ECR plasma will be created to produce direct niobium ion deposition. The central cylindrical grid is DC biased to control the deposition energy. This paper describes the design of several subcomponents including the vacuum chamber, RF supply, biasing grid and magnet coils. Operational parameters are compared between an operating sample deposition system and this system. Engineering progress toward the first plasma creation will be reported here.
NTIS
Cavities; Coating; Copper; Deposition; Metal Films; Metallic Plasmas; Niobium; Thin Films; Vacuum Chambers

20060022628 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Design and Testing of a 2K Superfluid Helium Heat Station
Hicks, W. R.; Daly, E. F.; Preble, J.; Wiseman, M.; Rode, C.; January 2005; 12 pp.; In English
Report No.(s): DE2006-876073; No Copyright; Avail.: Department of Energy Information Bridge

Three transitional cryomodules (SL21, FEL03, Renascence) have been constructed as part of an energy upgrade effort at Thomas Jefferson National Accelerator Facility (JLab). Each transitional cryomodule contains eight superconducting radio-frequency (SRF) cavities. Within the vacuum vessel, waveguides transmit up to 13 kW of RF power to the superconducting niobium cavities. The waveguides also provide the thermal transition between the room temperature ceramic RF window and the niobium fundamental power coupler (FPC), a 300K temperature gradient across approx. 20cm. The thermal performance of the waveguides is determined in part by the placement of heat stations and bellows. The original 13 kW waveguide design incorporated a single 60 K heat station and two bellows resulting in a total heat load (static + dynamic) to the FPC of approx. 3W per waveguide. To minimize this heat load and stabilize the FPC temperatures, a 2K superfluid helium heat station design was incorporated into the second transitional cryomodule, FEL03, installed in the JLab Free Electron Laser (FEL). The designed heat station is capable of removing up to 1.12W, with a bath temperature of 2.05K, while

remaining sub-lambda. This paper describes the design, analysis and testing of the heat station.
NTIS
Linear Accelerators; Liquid Helium; Liquid Helium 2; Superconducting Cavity Resonators; Superfluidity; Design Analysis; Superconductivity

20060022629 Union Coll., Schenectady, NY, USA
Measurements of the Neutron Magnetic Form Factor with CLAS
Vineyard, M. F.; January 2005; 28 pp.; In English
Report No.(s): DE2006-876062; No Copyright; Avail.: National Technical Information Service (NTIS)
This document provides an overview on the motivation; Jefferson Lab Experiment 94-017; CEBAF large acceptance spectrometer; data analysis; preliminary results; and summary.
NTIS
Form Factors; Neutrons

20060022630 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Experimental Studies on the Electric Form Factor of the Neutron
Reitz, B.; January 2005; 40 pp.; In English; Nucleon '05 Workshop on Nucleon Form Factors, 12-14 Oct. 2005, Frascati, Italy
Report No.(s): DE2006-876053; No Copyright; Avail.: National Technical Information Service (NTIS)
This document presents the history of neutron electric form factor from cross sections; the double polarization experiments: polarized deuterium, recoil polarization, and polarized helium-3; and the summary/outlook.
NTIS
Form Factors; Neutrons; Nucleons

20060022631 Stanford Linear Accelerator Center, Stanford, CA, USA
PEP-II and KEKB Operational Status
Seeman, J.; January 2006; 10 pp.; In English
Report No.(s): DE2006-876047; SLAC-PUB-11670; No Copyright; Avail.: National Technical Information Service (NTIS)
The present two B-Factories, PEP-II at SLAC in California and KEKB at KEK in Tsukuba, Japan, operate at the Upsilon 4S and have reached parameter levels unprecedented for e+e- colliders. They have provided very large data samples for their respective particle detectors, BaBar and BELLE. Luminosity has exceeded 1.5 x 10(sup 34)/cm(sup 2)/s. Beam currents have reached 2.5 A with 1600 positron bunches spaced by 4 nsec. Continuous injection with the detectors taking data has added significantly to data collection rates by about 40%. Bunch-by-bunch feedback systems damp strong longitudinal and transverse coupled bunch instabilities. The beam-beam interaction has allowed high tune shift levels even in the presence of parasitic crossing and crossing angle effects. Both B-Factory colliders have significant near term luminosity improvement programs.
NTIS
Beam Currents; Linear Accelerators

20060022637 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Parametric Resonance Ionization Cooling and Reverse Emittance Exchange for Muon Colliders. (COOL05 International Workshop, Galena, Illinis, September 19-23, 2005)
Derbenev, Y.; Sep. 2005; 20 pp.; In English
Report No.(s): DE2006-876020; No Copyright; Avail.: Department of Energy Information Bridge
Two methods to cool muon beams deeply below the limit conventionally established for the ionization cooling are proposed. In Phase Ionization Cooling (PIC), the beam is focused at wedge absorber plates each half of particle oscillation period by imposing a weak parametric resonance along the beam path. The resonance growth of particle amplitude is surmounted by the ionization cooling. At optimum, such arrangement results in reduction of each of two transverse emittances by an order of value in addition to the preceding 6D ionization cooling. Next, resonance focusing and transverse cooling can be continued in the regime of a fast Reverse Emittance Exchange (REMEX). Here, the sign of the absorber wedge is opposite to PIC while the dispersion increased. REMEX to be accompanied by the bunch lengthening and acceleration in order to maintain the relative energy spread at an appropriate level. The limitations due to energy straggling in absorber will be evaluated, and possibilities of beam conditioning against aberrations and muon space charge will be illustrated for specific

beam transports. Estimates of Muon Collider luminosity versus muon production rate will be presented.
NTIS
Cooling; Emittance; Ionization; Muons

20060022693
ISR Physics at Babar
Druzhinin, V.; Aug. 2005; 10 pp.; In English
Report No.(s): DE2006-876046; SLAC-PUB-11673; No Copyright; Avail.: Department of Energy Information Bridge
We present a review of BaBar results on e(sup +)e(sup -) annihilations into exculsive hadronic final states using the initial state radiation technique. Cross sections over the (radical)s range from threshold to 4.5 GeV, with very small point-to-point systematic errors, are presented for the 3(pi), 2(pi)(sup +)(pi)(sup -)), 3(pi)(sup +)(pi)(sup -)), 2((pi)(sup +)(pi)(sup -)) 2(pi)(sup O), K(sup +)K(sup -)(pi)(sup +)(sup -), 2(K(sup +)K(sup -)) and p(bar p) final states. The proton form factor and the ratio of its electric and magnetic components are also presented.
NTIS
Annihilation Reactions; Hadrons; Systematic Errors

20060022694 Stanford Linear Accelerator Center, Stanford, CA, USA
Determinations of /V(ub)/ from Inclusive Semileptonic B Decays with Reduced Model Dependence
Aubert, B.; Barate, R.; Boutigny, D.; Couderc, F.; Karyotakis, Y.; January 2005; 12 pp.; In English
Report No.(s): DE2006-876044; SLAC-PUB-11582; No Copyright; Avail.: Department of Energy Information Bridge
We report two novel determinations of /V(sub ub)/ with reduced model dependence, based on measurements of the mass distribution of the hadronic system in semileptonic B decays. Events are selected by fully reconstructing the decay of one B meson and identifying a charged lepton from the decay of the other B meson from (Upsilon)(4S) (yields) (B(bar B) events. In one approach, we combine the inclusive (bar B) (yields) X(sub u)(ell)(bar (nu)) rate with a measurement of the inclusive B (yields) X(sub s)(gamma) photon energy spectrum. We obtain /V(sub ub)/ = (4.43 (+-) 0.38(sub stat) (+-) 0.25(sub syst) (+-) 0.29(sub theo)) x 10(sup -3). In another approach we measure the total (bar B) (yields) X(sub u) (ell)(bar (nu)) rate over the full phase space and find /V(sub ub)/ = (3.84 (+-) 0.70(sub stat) (+-) 0.30(sub syst) (+-) 0.10(sub theo)) x 10(sup -3).
NTIS
Mesons; Particle Decay

20060022702 New Mexico Univ., Albuquerque, NM, USA, Stanford Linear Accelerator Center, Stanford, CA, USA
Progress on a Vlasov Treatment of Coherent Synchrotron Radiation from Arbitrary Planar Orbits
Bassi, G.; Ellison, J. A.; Warnock, R.; January 2006; 8 pp.; In English
Report No.(s): DE2006-876033; SLAC-PUB-11684; No Copyright; Avail.: Department of Energy Information Bridge
We report on our progress in the development of a fully self-consistent Vlasov treatment of coherent synchrotron radiation (CSR) effects on particle bunches traveling on arbitrary planar orbits. First we outline our Vlasov approach and the approximation we are currently studying. Then we discuss recent numerical results for a benchmark model studied extensively with codes by several authors.
NTIS
Boltzmann-Vlasov Equation; Coherent Radiation; Synchrotron Radiation

20060022705 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
CEBAF Control Room Renovation
Spata, M.; Cuffe, A.; Fanning, H.; Oren, T.; January 2005; 8 pp.; In English
Report No.(s): DE2006-876079; No Copyright; Avail.: Department of Energy Information Bridge
The Machine Control Center (MCC) at Jefferson Lab's Continuous Electron Beam Accelerator Facility (CEBAF) was constructed in the early 1990s and based on proven technology of that era. Through our experience over the last 15 years and in our planning for the facilities 12 GeV upgrade we reevaulated the control room environment to capitalize on emerging visualization and display technologies and improve on work-flow processes and ergonomic attributes. The renovation was performed in two phases during the summer of 2004, with one phase occuring during machine operations and the latter, more extensive phase, occuring during our semi-annual shutdown period. The new facility takes advantage of advances in display technology, analog and video signal management, server technology, ergonomic workspace design, lighting engineering,

acoustic ceilings and raised flooring solutions to provide a marked improvement in the overall environment of machine operations.
NTIS
Ground Based Control; Integrated Mission Control Center; Linear Accelerators; Maintenance

20060022716 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Temporal Characterization of Electron Beam Bunches with a Fast Streak Camera at JLAB FEL Facility
Zhang, S.; Benson, S.; Doluglas, D.; Hardy, D.; Jordan, K.; January 2005; 8 pp.; In English
Report No.(s): DE2006-876226; No Copyright; Avail.: National Technical Information Service (NTIS)
The design and construction of an optical transport that brings synchrotron radiation from electron bunches to a fast streak camera in a remote area has become a useful tool for online observation of bunch length and stability. This paper will report the temporal measurement we have done and the longitudinal phase space measurement through an imaging optical transport system.
NTIS
Electron Beams; Free Electron Lasers; Streak Cameras

20060022717 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Incorporation of a PBSE Array Based Spectrograph into EPICS Using Labview at the JLAB FEL Facility
Hardy, D.; Benson, S.; Shinn, M.; Zhang, S.; Aug. 2005; 8 pp.; In English
Report No.(s): DE2006-876223; No Copyright; Avail.: Department of Energy Information Bridge
A real-time spectrograph with a 1Hz update rate was designed and installed at the JLab FEL facility using a Cal Sensors PbSe array and a Roper Scientific SpectraPro 300i monochromator. This device is automated with the use of new control controls software. This paper describes the components of the software for the real-time spectrograph and its performance. The software consists of an EPICS channel access client (CA) on a remote PC running LabVIEW with modified vendor software. This allows PC based diagnostics to be used in EPICS.
NTIS
Free Electron Lasers; Linear Accelerators; Spectrographs

20060022718 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Evaluating the Potential of Commercial GIS for Accelerator Configuration Management
Larrieu, T. L.; Robin, Y. R.; White, K.; Slominski, R.; January 2005; 12 pp.; In English
Report No.(s): DE2006-876082; No Copyright; Avail.: Department of Energy Information Bridge
The Geographic Information System (GIS) is a tool used by industries needing to track information about spatially distributed assets. A water utility, for example, must know not only the precise location of each pipe and pump, but also the respective pressure rating and flow rate of each. In many ways, an accelerator such as CEBAF (Continuous Electron Beam Accelerator Facility) can be viewed as an 'electron utility.' Whereas the water utility uses pipes and pumps, the 'electron utility' uses magnets and RF cavities. At Jefferson lab we are exploring the possibility of implementing ESRI's ArcGIS as the framework for building an all-encompassing accelerator configuration database that integrates location, configuration, maintenance, and connectivity details of all hardware and software. The possibilities of doing so are intriguing. From the GIS, software such as the model server could always extract the most-up-to-date layout information maintained by the Survey & Alignment for lattice modelling. The Mechanical Engineering department could use ArcGIS tools to generate CAD drawings of machine segments from the same database.
NTIS
Configuration Management; Geographic Information Systems

20060022719 Istituto Nazionale di Fisica Nucleare, Genoa, Italy, Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA, Rensselaer Polytechnic Inst., Troy, NY, USA
Pentaquarks: the Latest Experimental Results
Battaglieri, M.; De Vita, R.; Kubarovsky, V.; January 2005; 14 pp.; In English
Report No.(s): DE2006-876013; No Copyright; Avail.: Department of Energy Information Bridge
After the claim of the possible discovery of a pentaquark state, many experiments reported positive and negative results opening a discussion about the pentaquark existence. New experiments with high resolution and high statistics are needed in the reaction channels and for the kinematics of the positive results to solve the controversy. Jefferson Lab started a

comprehensive program to search for pentaquark in photoproduction at threshold on proton and deuteron targets, collecting more than 10 times the existing statistics. The first experiment on the proton (g11) just finished to analyze the data, and the first results of the pentaquark search are reported here.
NTIS
Deuterium; Quantum Chromodynamics; Protons; Photoproduction

20060022720 Stanford Linear Accelerator Center, Stanford, CA, USA
Search for T, CP and CPT Violation in B(sup o)-B(sup bar o) Mixing with Inclusive Dilepton Events
Aubert, B.; Barate, R.; Bona, M.; Boutigny, D.; Couderc, F.; Mar. 2006; 12 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2006-878344; SLAC-PUB-11787; BABAR-PUB-06/11; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors report the results of a search for T, CP and CPT violation in B)sup 0)-)bar B))sup 0) mixing using an inclusive dilepton sample collected by the BABAR experiment at the PEP-II B Factory. Using a sample of 232 million B)bar B) pairs, with a simultaneous likelihood fit of the same-sign and opposite-sign dileptons, they measure the T and Cp violation parameter q/p-1 = (-0.8)+-) 2.7(stat.))+-) 1.9(syst.)) x 10)sup -3), and the CPT and CP parameters Im z = (-13.9)+-) 7.3(stat.))+-) 3.2(syst.)) x 10)sup -3) and)Delta))Lambda) x Re z = (-7.1)+-) 3.9(stat.))+-) 2.0(syst.)) x 10)sup -3) ps)sup -1). The statistical correlation between the measurements of Im z and)Delta))Lambda) x Re z is 76%.
NTIS
CP Violation; Frequencies; Oscillations

20060022722 Wyoming Univ., Laramie, WY, USA
Novel Composite Hydrogen-Permeable Membranes for Non-Thermal Plasma Reactors for the Decomposition of Hydrogen Sulfide. Annual Report, October 1, 2004-September 30, 2005
Argyle, M. D.; Ackerman, J. F.; Muknahallipatna, S.; Hamann, J. C.; Legowski, S.; Oct. 2005; 38 pp.; In English
Contract(s)/Grant(s): DE-FC26-03NT41963
Report No.(s): DE2006-878291; No Copyright; Avail.: Department of Energy Information Bridge

The goal of this experimental project is to design and fabricate a reactor and membrane test cell to dissociate hydrogen sulfide (H2S) in a non-thermal plasma and recover hydrogen (H2) through a superpermeable multi-layer membrane. Superpermeability of hydrogen atoms (H) has been reported by some researchers using membranes made of Group V transition metals (niobium, tantalum, vanadium, and their alloys), although it has yet to be confirmed in this study. A pulsed corona discharge (PCD) reactor has been fabricated and used to dissociate H2S into hydrogen and sulfur. A nonthermal plasma cannot be produced in pure H2S with our reactor geometry, even at discharge voltages of up to 30 kV, because of the high dielectric strength of pure H2S (approx. 2.9 times higher than air). . Therefore, H2S was diluted in another gas with lower breakdown voltage (or dielectric strength). Breakdown voltages of H2S in four balance gases (Ar, He, N2 and H2) have been measured at different H2S concentrations and pressures. Breakdown voltages are proportional to the partial pressure of H2S and the balance gas. H2S conversion and the reaction energy efficiency depend on the balance gas and H2S inlet concentrations. With increasing H2S concentrations, H2S conversion initially increases, reaches a maximum, and then decreases. H2S conversion in atomic balance gases, such as Ar and He, is more efficient than that in diatomic balance gases, such as N2 and H2. These observations can be explained by the proposed reaction mechanism of H2S dissociation in different balance gases. The results show that nonthermal plasmas are effective for dissociating H2S into hydrogen and sulfur.
NTIS
Decomposition; Hydrogen; Hydrogen Sulfide; Membranes; Sulfides; Thermal Plasmas; Thyratrons

20060022723 Stanford Linear Accelerator Center, Stanford, CA, USA, Wisconsin Univ., Madison, WI, USA
Search for Radiative Penguin Decays B(sup +) -\g p(sup +)gamma, B(sup 0) -\g p(sup 0)gamma, and B(sup 0) -\g omega gamma
Tan, P.; January 2004; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2006-878048; SLAC-PUB-11554; No Copyright; Avail.: Department of Energy Information Bridge

A search for the decays B (yields) (rho)(770)(gamma) and B(sup 0) (yields) (omega)(782) is performed on a sample of 211 million (Upsilon)(4S) (yields) B(bar B) events collected by the BABAR detector at the PEP-II asymmetric-energy e(sup +)e(sup -) storage ring. No evidence for the decays is seen. We set the following limits on the individual branching fractions

(Beta)(B(sup +) (yields) (rho)(sup +)(gamma)) \h 1.8 x 10(sup -6), (Beta)(B(sup 0) (yields) (rho)(sup 0)(gamma)) \h 0.4 x 10(sup -6), and (Beta)(B(sup 0) (yields) (omega)(gamma)) \h 1.0 x 10(sup -6) at the 90% confidence level (C.L.). We use the quark model to limit the combined branching fraction (bar (Beta))(B (yields) ((rho)/(omega))(gamma)) \h 1.2 x 10(sup -6) and constrain V(sub td)/V(sub ts).
NTIS
Quark Models; Storage Rings (Particle Accelerators); Asymmetry

20060022727 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Jefferson Lab High Power Light Source
Boyce, J. R.; January 2005; 12 pp.; In English
Report No.(s): DE2006-876085; No Copyright; Avail.: National Technical Information Service (NTIS)
Jefferson Lab has designed, built and operated two high average power free-electron lasers (FEL) using superconducting RF (SRF) technology and energy recovery techniques. Between 1999-2001 Jefferson Lab operated the IR Demo FEL. This device produced over 2 kW in the mid-infrared, in addition to producing world record average powers in the visible (50 W), ultraviolet (10 W) and terahertz range (50 W) for tunable, short-pulse (lesser than ps) light. This FEL was the first high power demonstration of an accelerator configuration that is being exploited for a number of new accelerator-driven light source facilities that are currently under design or construction. The driver accelerator for the IR Demo FEL uses an Energy Recovered Linac (ERL) configuration that improves the energy efficiency and lowers both the capital and operating cost of such devices by recovering most of the power in the spent electron beam after optical power is extracted from the beam. The IR Demo FEL was de-commissioned in late 2001 for an upgraded FEL for extending the IR power to over 10 kW and the ultraviolet power to over 1 kW. The FEL Upgrade achieved 10 kW of average power in the mid-IR (6 microns) in July of 2004, and its IR operation currently is being extended down to 1 micron. In addition, we have demonstrated the capability of on/off cycling and recovering over a megawatt of electron beam power without diminishing machine performance.
NTIS
Free Electron Lasers; Light Sources

20060022728 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Versatile Carrier Board and Associated Timer Module Applications
Evans, R.; Grippo, A.; Jordan, K.; January 2005; 10 pp.; In English
Report No.(s): DE2006-876087; No Copyright; Avail.: National Technical Information Service (NTIS)
Because of a need for fast prototyping due to frequent upgrades and a large variety of users at the Jefferson Lab Free Electron Laser Facility (FEL), a 4-slot carrier board was designed along the lines of the Industry Pack carriers, with a 6U4HP form factor. In one slot is an Altera Field Programmable Gate Array (FPGA) which communicates with an Experimental Physics and Industrial Control Software (EPICS) interface through the main bus, in the immediate case VME, but potentially PCI and others. The FPGA also provides 64 bits of digital i/o and communicates with a local bus that covers the other 3 slots. In these 3 slots may be placed a variety of daughter boards that may be of a size to span 1, 2 or even all 3 spare slots, depending on the job it has to do. Among the uses implemented in the FEL were a simple digital i/o board (only the first slot occupied), and a timer module occupying 2 slots.
NTIS
Form Factors; Free Electron Lasers; Timing Devices

20060022734 Brookhaven National Lab., Upton, NY USA, Wuppertal Univ., Germany
Density of States Method at Finite Chemical Potential
Schmidt, C.; Fodor, Z.; Katz, S.; January 2005; 12 pp.; In English
Report No.(s): DE2006-876091; BNL-75354-2006-CP; No Copyright; Avail.: Department of Energy Information Bridge
We study the density of states method to explore the phase diagram of the chiral transition on the temperature and quark chemical potential plane. Four quark flavors are used in the analysis. Though the method is quite expensive small lattices show an indication for a triple-point connecting three different phases on the phase diagram.
NTIS
Phase Diagrams; Quantum Chromodynamics

71
ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

20060021635 Army Construction Engineering Research Lab., Champaign, IL USA
Effect of Age-Dependent Forest Characteristics on Acoustic Propagation
Swearingen, Michelle E; Mar 2006; 38 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447408; ERDC/CERL-TR-06-4; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447408; Avail.: Defense Technical Information Center (DTIC)

This report contains the results of a theoretical study on the impact of forest stand age on acoustic propagation. A red pine forest was simulated at 10, 20, 30, 40, and 80 years of age, with assumptions that it was being maintained for utility pole harvest. Forest parameters, such as density, height, and diameter of trees, were used to predict vertical sound speed profiles and then acoustic propagation. The resulting spectra were weighted to simulate artillery and rifle fire. Spectra and sound exposure levels were examined to determine whether the forest stand age has s significant impact on acoustic propagation within a forest.
DTIC
Acoustic Propagation; Age Factor; Forests; Noise Pollution

20060021650 West Virginia Univ., Morgantown, WV USA
Part I - Effects of Diameter on Active Noise Control in Rectangular and Round Ducts
Slagley, Jeremy M; Guffey, Steven E; May 2006; 29 pp.; In English
Report No.(s): AD-A447684; CIO4-1774; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447684; Avail.: CASI: A03, Hardcopy

Active noise control (ANC) is particularly useful in hard-walled ducts where plane waves propagate. Higher order mode waves are much more difficult to control. Basic acoustic principles dictate that tile cut-on frequency at which higher order modes will first begin to eclipse simple plane waves in a duct will be determined by the cross-sectional diameter of the duct. The lowest frequency for higher order modes will increase as duct diameter decreases. Therefore, the range of frequencies where plane waves dominate will be greater and effective control using ANC better as duct diameter decreases. The result is that somewhat higher frequencies can be controlled with ANC for smaller diameters. Below the first higher order mode cut-on frequency for the largest size studied, there should be little difference in ANC effectiveness between the duct sizes. To test those suppositions, a commercially-available ANC system was used to reduce random noise in rectangular and round ducts having different diameters. Results showed that insertion loss (IL) ranged from S to 30 dB in frequencies ranging from 40-1000 Hz, and varied inversely with size as expected. There was no difference in IL below 280 Hz (p=0.7751) between the different diameter ducts. There was a significant difference between duct diameters above 280 Hz (p\h0.0001). The same tests were conducted on a rectangular duct with one cross-sectional dimension fixed and one varied at seven different sizes. Results showed similar IL from 5 to 30 dB that varied inversely with size. There was no difference in IL below 280 Hz (p=0.3348) between the different duct dimensions. There was a significant difference between duct dimensions above 280 Hz (p=0.0220).
DTIC
Active Control; Ducts; Noise Reduction; Plane Waves

20060021651 West Virginia Univ., Morgantown, WV USA
Part II - Effects of Cross-Sectional Partitioning on Active Noise Control in Round Ducts
Slagley, Jeremy M; Guffey, Steven E; May 2006; 37 pp.; In English
Report No.(s): AD-A447685; CIO4-1775; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447685; Avail.: CASI: A03, Hardcopy

Active noise control (ANC) is particularly useful in hard-walled ducts where plane waves propagate. Higher order mode waves are much more difficult to control Basic acoustic principles dictate that the cut-on frequency at which higher order modes will first begin to eclipse simple plane waves in a duct will be determined by the cross-sectional diameter of the duct. The lowest frequency for higher order modes will increase as duct diameter decreases. Therefore, the range of frequencies where plane waves dominate will be greater and effective control using ANC better as duct diameter decreases. The result is that somewhat higher frequencies can be controlled with ANC for smaller diameters. If smaller diameters have broader frequency ranges that can be controlled with ANC, perhaps one could extend the frequency range for a large cross-section by partitioning it into smaller cross- sections. This hypothesis was tested by two methods of cross-sectional partitioning.

Partitioning was achieved in one design by inserting a smaller duct inside a large duct. In a second design, a cross-shaped partition was inserted inside the large duct. ANC IL results were 1.7 to 2 dB better for the large duct partitioned by a smaller inner duct than the large duct alone (p=0.0146 for low frequency and p=0.0333 for high frequency). ANC insertion loss was 5.8 dB better for the large duct partitioned by a cross-shaped splitter at high frequencies than the large duct alone (p=0.0003). However, the cross-shaped partition system was 5.6 dB less effective at low frequencies than the large duct ANC IL alone (p\h0.0001).
DTIC
Active Control; Ducts; Noise Reduction; Plane Waves

20060021742 Mystic Aquarium and Inst. for Exploration, Mystic, CT USA
Continued Investigation of Immune Competence in Navy Marine Mammals: Implications for Health Viability and Mission Readiness
Romano, Tracy; Jan 2006; 5 pp.; In English
Contract(s)/Grant(s): N00014-04-1-0816
Report No.(s): AD-A447855; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447855; Avail.: CASI: A01, Hard-copy

Deployed Navy dolphins are exposed to infectious agents and pollutants in environments that may compromise their health and system mission. Challenges dolphins experience during deployments include: transport to different time zones, changes in water temperature, contaminated water, varying acoustic levels, and exposure to wild marine mammal populations. These challenges (confinement/restraint, thermal stress, pollutants, and auditory stress) have been shown to cause immunosuppression in other manuals. Our laboratory has developed and is continuing to develop dolphin-specific markers and assays to assess immunocompetence in cetaceans. These markers and assays were used to evaluate sound as a stressor and looked at the effects of sound level and duration on dolphins as part of the 'Temporary Threshold Shift' studies conducted by scientists at the Navy. Moreover, developed reagents and assays were used to assess immunocompetence in wild bottlenose dolphins. The neural-immune tests developed and adapted for bottlenose dolphins do show changes in both captive and wild animals depending on stress (e.g. duration of sound exposure), geographic location and disease state. These tests will be useful for monitoring health in both captive and wild dolphins as well as useful in assessing efficacy of vaccines, and the monitoring of the impact of the environment and various stressors on dolphin health.
DTIC
Contaminants; Contamination; Health; Hearing; Infectious Diseases; Navy; Thermal Stresses; Viability

20060021809 Massachusetts Inst. of Tech., Cambridge, MA USA
Analysis of 2-Axis Pencil Beam Sonar Microbathymetric Measurements of Mine Burial at the Martha's Vineyard Coastal Observatory
Gotowka, Brendan R; Sep 2005; 98 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447904; No Copyright; Avail.: CASI: A05, Hardcopy

The changing state of warfare has driven the US Navy's area of operations closer to shore into littoral coastal waters. Mine Warfare has been proven as an extremely effective means of battlespace control in these waters. Mines can be inexpensively mass produced and rapidly deployed over large areas. The most common type of mine in use is the bottom placed mine, an object with simple geometry that sits on the seafloor. These mines often exhibit scour induced burial below the seafloor, making detection through traditional mine hunting methods difficult or impossible, while the mines themselves remain lethal. The Office of Naval Research (ONR) has developed a computer model that predicts the extent of mine burial to aid mine hunting and mine clearing operations. Investigations under ONR s Mine Burial Program are presently being conducted to calibrate and validate this model. This thesis uses data from the deployment of an acoustically instrumented model mine near the Martha s Vineyard Coastal Observatory in part of a larger, 16 total object investigation. A 2-axis pencil beam sonar was deployed concurrently with the mine to obtain microbathymetric measurements of the scour pit development and the progression of mine burial. Data correction techniques to correct for beam pattern induced bathymetry errors and a transformed coordinate system are detailed within. An analysis of scour pit dimensions includes scour depth, area, and volume as well as a look into percent burial by depth as a characteristic measurement important for operational mine hunting. The progression of mine burial is related to the wave climate, unsteady flow hydrodynamic forcing, and bed-load transport. The analysis examines the relative roles of these mechanisms in the scour-infill-bury process.
DTIC
Coasts; Observatories; Pencil Beams; Sonar; Vineyards

20060022559 AI Signal Research, Inc., Huntsville, AL, USA

Wireless Acoustic Measurement System

Anderson, Paul D.; Dorland, Wade D.; August 17, 2006; 1 pp.; In English

Contract(s)/Grant(s): NAS13-02018

Report No.(s): NP-2005-10-00071-SSC; SSC-00215-2; No Copyright; Avail.: CASI: A01, Hardcopy

A prototype wireless acoustic measurement system (WAMS) is one of two main subsystems of the Acoustic Prediction/Measurement Tool, which comprises software, acoustic instrumentation, and electronic hardware combined to afford integrated capabilities for predicting and measuring noise emitted by rocket and jet engines. The other main subsystem is described in 'Predicting Rocket or Jet Noise in Real Time' (SSC-00215-1), which appears elsewhere in this issue of NASA Tech Briefs. The WAMS includes analog acoustic measurement instrumentation and analog and digital electronic circuitry combined with computer wireless local-area networking to enable (1) measurement of sound-pressure levels at multiple locations in the sound field of an engine under test and (2) recording and processing of the measurement data. At each field location, the measurements are taken by a portable unit, denoted a field station. There are ten field stations, each of which can take two channels of measurements. Each field station is equipped with two instrumentation microphones, a micro-ATX computer, a wireless network adapter, an environmental enclosure, a directional radio antenna, and a battery power supply. The environmental enclosure shields the computer from weather and from extreme acoustically induced vibrations. The power supply is based on a marine-service lead-acid storage battery that has enough capacity to support operation for as long as 10 hours. A desktop computer serves as a control server for the WAMS. The server is connected to a wireless router for communication with the field stations via a wireless local-area network that complies with wireless-network standard 802.11b of the Institute of Electrical and Electronics Engineers. The router and the wireless network adapters are controlled by use of Linux-compatible driver software. The server runs custom Linux software for synchronizing the recording of measurement data in the field stations. The software includes a module that provides an intuitive graphical user interface through which an operator at the control server can control the operations of the field stations for calibration and for recording of measurement data. A test engineer positions and activates the WAMS. The WAMS automatically establishes the wireless network. Next, the engineer performs pretest calibrations. Then the engineer executes the test and measurement procedures. After the test, the raw measurement files are copied and transferred, through the wireless network, to a hard disk in the control server. Subsequently, the data are processed into 1/3-octave spectrograms.

Author

Acoustic Measurement; Wireless Communication; Prototypes; Local Area Networks; Circuits; Microphones; Radio Antennas; Storage Batteries

72
ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see *73 Nuclear Physics*.

20060021690 Naval Research Lab., Washington, DC USA

Optical Studies of Single Quantum Dots

Gammon, Daniel; Steel, Duncan G; Oct 2002; 14 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447752; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447752; Avail.: CASI: A03, Hard-copy

Atomic physics progressed rapidly at the beginning of the last century, thanks, in large part, to optical spectroscopy. Quantization and spin were discovered through optical studies, as were other fundamental atomic properties. With the advent of the laser, physicists learned how to manipulate atomic wavefunctions by applying coherent optical fields. More discoveries followed. Now, at the beginning of the new century, optical techniques are being used to explore a new scientific frontier: the atomlike entities known as quantum dots (QDs). Measuring 1-100 nm across, QDs are semiconductor structures in which the electron wavefunction is confined in all three dimensions by the potential energy barriers that form the QD's boundaries. A QD's electronic response, like that of a single atom, is manifest in its discrete energy spectrum, which appears when electron-hole pairs are excited. Although the wavefunction of a QD electron, and its corresponding hole, extends over many thousands of lattice atoms, the pair--termed an exciton--behaves in a quantized and coherent fashion. The coherence is relatively easy to detect and control optically--for two reasons. First, the superposition of the ground and excited states dephases more slowly in QDs than in higher-dimensional semiconductor structures. Second, QDs have large dipole moments

(50-100 times larger than those of atoms). Thanks to these advantages, it is possible to probe and manipulate the wavefunction of a single QD.
DTIC
Optical Properties; Quantum Dots

74
OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20060021991 Lawrence Livermore National Lab., Livermore, CA USA
Optical Design for the Narrow Field InfraRed Adaptive Optics System (NFIRAOS) Petite on the Thirty Meter Telescope
Bauman, B. J.; Gavel, D. T.; Gavel, R. G.; Dekany, R. G.; Ellerbroek, B. L.; Aug. 05, 2005; 14 pp.; In English
Report No.(s): DE2006-875653; UCRL-PROC-214331; No Copyright; Avail.: Department of Energy Information Bridge

We describe an exploratory optical design for the Narrow Field InfraRed Adaptive Optics (AO) System (NFIRAOS) Petite, a proposed adaptive optics system for the Thirty Meter Telescope Project. NFIRAOS will feed infrared spectrograph and wide-field imaging instruments with a diffraction limited beam. The adaptive optics system will require multi-guidestar tomographic wavefront sensing and multi-conjugate AO correction. The NFIRAOS Petite design specifications include two small 60 mm diameter deformable mirrors (DM's) used in a woofer/tweeter or multiconjugate arrangement. At least one DM would be a micro-electromechanical system (MEMS) DM. The AO system would correct a 10 to 30 arcsec diameter science field as well as laser guide stars (LGS's) located within a 60 arcsec diameter field and low-order or tip/tilt natural guide stars (NGS's) within a 60 arcsec diameter field. The WFS's are located downstream of the DM's so that they can be operated in true closed-loop, which is not necessarily a given in extremely large telescope adaptive optics design. The WFS's include adjustable corrector elements which correct the static aberrations of the AO relay due to field position and LGS distance height.
NTIS
Adaptive Optics; Design Analysis; Infrared Instruments; Optical Equipment; Telescopes

20060021992 Lawrence Livermore National Lab., Livermore, CA USA
Engineering Meter-Scale Laser Resistant Coatings for the near IR
Stolz, C. J.; Adams, J. J.; Shirk, M. D.; Norton, M. A.; Weiland, T. L.; Sep. 10, 2005; 16 pp.; In English
Report No.(s): DE2006-875656; UCRL-CONF-215252; No Copyright; Avail.: Department of Energy Information Bridge

Laser resistant coatings are needed for beam steering (mirrors), pulse switching (polarizers), and high transport efficiency on environmental barriers (windows / lenses) on large laser systems. A range of defects limit the exposure fluence of these coatings. By understanding the origin and damage mechanisms for these defects, the deposition process can be optimized to realize coatings with greater laser resistance. Electric field modeling can provide insight into which defects are most problematic. Laser damage growth studies are useful for determining a functional laser damage criteria. Mitigation techniques such as micro-machining with a single-crystal diamond cutting tool or short pulse laser ablation using the burst technique can be used to arrest growth in damage sites to extend optic lifetime.
NTIS
Lasers; Near Infrared Radiation

76
SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering*; and *36 Lasers and Masers*.

20060021665 Ames Lab., IA USA
In- and Out-of-Plane Propagation of Electromagnetic Waves in Low Index Contrast Two Dimensional Photonic Crystals
Foteinopoulou, S; Rosenberg, A; Sigalas, M M; Soukoulis, C M; Jan 15, 2001; 8 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-82
Report No.(s): AD-A447712; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447712; Avail.: CASI: A02, Hard-copy

Propagation of electromagnetic waves through a two-dimensional triangular lattice has been studied for different values of refractive index contrast between the constituent dielectrics, and for angles of incidence both in and out of the plane of periodicity. Transmission results have been obtained both experimentally and with the transfer matrix technique, and good agreement has been found between the two. Comparison with band structure calculations has also been made.
DTIC
Crystals; Electromagnetic Radiation; Electromagnetic Wave Transmission; Wave Propagation

20060021699 Naval Research Lab., Washington, DC USA
Photonic Crystals: Intensity-Dependent Transmission Protects Sensors
Rosenberg, Armand; Shirk, James; Apr 2000; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447763; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447763; Avail.: CASI: A01, Hard-copy

Nonlinear absorption properties make photonic crystals useful optical limiters where protection is needed from sudden flashes of high-intensity light. Optical limiters are devices that exhibit high transmission at normal light intensities and a transmission that decreases as the light intensity rises. This intensity-dependent transmission can keep the transmitted light energy below some maximum value. The devices can perform several useful optical functions, the most obvious of which is protecting optical elements and sensors, including the eyes, from damage by sudden flashes of highintensity light. Desirable properties of a limiter include a low threshold, a fast response, and wide dynamic and transmission ranges
DTIC
Absorption; Crystals; Nonlinear Systems; Optical Equipment

20060022634 Stanford Linear Accelerator Center, Stanford, CA, USA
Resistive Wall Wake Effect of a Grooved Vacuum Chamber
Bane, K. L. F.; Feb. 2006; 8 pp.; In English
Report No.(s): DE2006-876031; SLAC-PUB-11677; No Copyright; Avail.: Department of Energy Information Bridge

We investigate the enhancement of the resistive wall impedance of a round, metallic beam pipe with longitudinal grooves.
NTIS
Impedance; Vacuum Chambers; Vacuum Effects; Wakes; Walls

20060022639 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
100 MV CW Cryomodule. SRF Workshop, July 11, 2005
Reece, C.; Jul. 2005; 42 pp.; In English
Report No.(s): DE2006-876019; No Copyright; Avail.: National Technical Information Service (NTIS)

A cryomodule designed for high-gradient CW operation has been built at Jefferson Lab. The Renascence cryomodule is the final prototype of a design for use in the 12 GeV CEBAF upgrade. The module uses eight 7-cell 1497 MHz cavities to be individually powered by 13 kW klystrons. Specifications call for providing \g109 MV CW with \h 250 W of dynamic heat at 2.07 K. The module incorporates a new generation of tuners and higher power input waveguides. A mixture of the new HG and LL cavity shapes are used. A new high thermal conductivity RF feedthrough has been developed and used on the 32 HOM coupler probes of Renascence. The cryomodule assembly is complete. Testing is to begin late June. Design features and initial test data will be presented.
NTIS
Continuous Radiation; Particle Accelerators

20060022696 Stanford Linear Accelerator Center, Stanford, CA, USA
Issues of Stability and Ground Motion in ILC
Seryi, A.; Hendrickson, L.; White, G.; Jan. 2006; 8 pp.; In English
Report No.(s): DE2006-876042; SLAC-PUB-11661; No Copyright; Avail.: Department of Energy Information Bridge

Stability of International Linear Collider is determined by the stability of the site, additional noises of beamline component, energy and kicker jitter, and performance of train-to-train and intratrain feedback. Stability goals in terms of the beam jitter at the end of the linac, in BDS and at the IP are discussed in this paper, and translated to stability goals for the

site and for component jitter. Present status of stability studies is reviewed and feasibility of achieving the stability goals is discussed.
NTIS
Earth Movements; Particle Accelerators; Stability

20060022697 Stanford Linear Accelerator Center, Stanford, CA, USA, Brookhaven National Lab., Upton, NY USA
IR Optimization, DID and Anti-DID
Seryi, A.; Parker, B.; Jan. 2006; 10 pp.; In English
Report No.(s): DE2006-876041; SLAC-PUB-11662; No Copyright; Avail.: National Technical Information Service (NTIS)
In this paper, we discuss optimization of the larger crossing angle Interaction Region of the Linear Collider, where specially shaped transverse field of the Detector Integrated Dipole can be reversed and adjusted to optimize trajectories of the low energy pairs, so that their majority would be directed into the extraction exit hole. This decreases the backscattering and makes background in 14mrad IR to be similar to background in 2mrad IR.
NTIS
Particle Accelerators; Extraction

20060022698 Tomsk State Univ., Tomsk, Russian Federation, Stanford Linear Accelerator Center, Stanford, CA, USA, University of Southern California, Los Angeles, CA, USA
Possibility of Noninvasive Micron High Energy Electron Beam Size Measurement Using Diffraction Radiation
Naumenko, G.; Potylitsyn, A.; Araki, S.; Aryshev, A.; Hayano, H.; May 2005; 8 pp.; In English
Report No.(s): DE2006-876038; SLAC-PUB-11680; No Copyright; Avail.: National Technical Information Service (NTIS)
A new method based on diffraction radiation emitted by charged particles moving through a slit between two flat rectangular plates inclined with respect to each other around the axis perpendicular to the slit has been suggested. The theoretical model for calculating the ODR radiation from such targets (including focusing by cylindrical lens) is presented. It is shown that the sensitivity of this method does not depend on the Lorenzfactor directly. The target with the dis-phased angle 6.2 milliradians and the slit width 425 microns was manufactured for experimental test. Some preliminary experimental results are presented.
NTIS
Charged Particles; Diffraction Radiation; Electron Beams; High Energy Electrons; Particle Accelerators

20060022699 Academia Sinica, Beijing, China, Stanford Linear Accelerator Center, Stanford, CA, USA
Beam-Beam Study on the Upgrade of Beijing Electron Positron Collider
Wang, S.; Cai, Y.; May 2005; 8 pp.; In English
Report No.(s): DE2006-876036; SLAC-PUB-11681; No Copyright; Avail.: National Technical Information Service (NTIS)
It is an important issue to study the beam-beam interaction in the design and performance of such a high luminosity collider as BEPCII, the upgrade of Beijing Electron Positron Collider. The weak-strong simulation is generally used during the design of a collider. For performance a large scale tune scan, the weak-strong simulation studies on beam-beam interaction were done, and the geometry effects were taken into account. The strong-strong simulation studies were done for investigating the luminosity goal and the dependence of the luminosity on the beam parameters.
NTIS
Beam Interactions; Electrons; Particle Accelerators; Positrons

20060022700 Montreal Univ., Quebec, Canada, Stanford Linear Accelerator Center, Stanford, CA, USA
Measurement of the Luminous-Region Profile at the PEP-II IP, and Application to e (plus or minus) Bunch-Length Determination
Viaud, B. F.; Narsky, I.; Kozaneckion, W.; O'Grady, C.; May 2005; 8 pp.; In English
Report No.(s): DE2006-876035; SLAC-PUB-11682; No Copyright; Avail.: Department of Energy Information Bridge
The three-dimensional luminosity distribution at the interaction point (IP) of the SLAC B-Factory is measured continuously, using e(sup +)e(sup -) (yields) e(sup +)e(sup -), (mu)(sup +)(mu)(sup -) events reconstructed online in the BABAR detector. The centroid of the transverse luminosity profile provides a very precise and reliable monitor of medium- and long-term orbit drifts at the IP. The longitudinal centroid is sensitive to variations in the relative RF phase of the colliding beams, both over time and differentially along the bunch train. The measured horizontal r.m.s. width of the distribution is consistent with a sizeable dynamic-(beta) effect; it is also useful as a benchmark of strong-strong beam-beam simulations. The

longitudinal luminosity distribution depends on the e(sup (+-)) bunch lengths and vertical IP (beta)-functions, which can be different in the high- and low-energy rings. Using independent estimates of the (beta)functions, we analyze the longitudinal shape of the luminosity distribution in the presence of controlled variations in accelerating RF voltage and/or beam current, to extract measurements of the e(sup +) and e(sup -) bunch lengths.
NTIS
Beam Currents; Luminosity; Particle Accelerators

20060022701 Stanford Linear Accelerator Center, Stanford, CA, USA, Fermi National Accelerator Lab., Batavia, IL, USA
Long-Term Simulation of Beam-Beam Effects in the Tevatron at Collision Energy
Kabel, A.; Sen, T.; January 2006; 8 pp.; In English
Report No.(s): DE2006-876034; SLAC-PUB-11683; No Copyright; Avail.: Department of Energy Information Bridge
The beam-beam effect is a significant source of nonlinearities in the Tevatron. We have developed a code which allows us to estimate its contribution to the finite lifetime of the anti-proton beam, both at collision and injection energy, by tracking realistic particle distribution for a high number of terms and extrapolating from the particle loss rate. We describe the physical modeling underlying the code and give benchmarking results.
NTIS
Beam Interactions; Collisions; Particle Accelerators; Simulation; Antiprotons

20060022703 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, Stanford Linear Accelerator Center, Stanford, CA, USA
Ultra-Bright Pulsed Electron Beam with Low Longitudinal Emittance
Zolotorev, M.; Commins, E. D.; Denes, P.; Heifets, S.; Hussain, Z.; January 2006; 8 pp.; In English
Report No.(s): DE2006-876032; SLAC-PUB-11685; No Copyright; Avail.: Department of Energy Information Bridge
Most existing electron sources extract electrons from conductors. Since the actual temperature inside the conductor is much less than the Fermi temperature of the conduction electrons, the electron degeneracy (delta)(sub f) is close to 1, the maximum allowed by the Pauli exclusion principle. However, during extraction several factors conspire together to reduce (delta)(sub f) many orders of magnitude, limiting the achieved values to (approx) 10(sup -5). A new concept is described for building a novel electron source designed to produce a pulsed beam with (delta)(sub f) (approx) 2 10(sup -3) and longitudinal emittance four orders of magnitude smaller than currently achieved values. This high brightness, low longitudinal emittance regime enables a wide range of novel applications that utilize angstrom-scale spatial resolution and eV-scale energy resolution. The current state of a proof-of-principle experiment conducted at LBNL is also described.
NTIS
Electron Beams; Emittance; Particle Accelerators

20060022706 Stanford Linear Accelerator Center, Stanford, CA, USA
Fully coherent X-ray Pluses from a Regenerative Amplifier Free Electron Laser
Huang, Z.; Ruth, R. D.; Jan. 2006; 16 pp.; In English
Report No.(s): DE2006-876447; SLAC-PUB-11598; No Copyright; Avail.: National Technical Information Service (NTIS)
We propose and analyze a novel regenerative amplifier free electron laser (FEL) to produce fully coherent x-ray pulses. The method makes use of narrow-bandwidth Bragg crystals to form an x-ray feedback loop around a relatively short undulator. Self-amplified spontaneous emission (SASE) from the leading electron bunch in a bunch train is spectrally filtered by the Bragg reflectors and is brought back to the beginning of the undulator to interact repeatedly with subsequent bunches in the bunch train. The FEL interaction with these short bunches not only amplifies the radiation intensity but also broadens its spectrum, allowing for effective transmission of the x-rays outside the crystal bandwidth. The spectral brightness of these x-ray pulses is about two to three orders of magnitude higher than that from a single-pass SASE FEL.
NTIS
Free Electron Lasers; Particle Accelerators; X Rays

20060022707 Stanford Linear Accelerator Center, Stanford, CA, USA, Stanford Univ., Stanford, CA, USA
Spectral-Angular Characteristics of the LCLS in the Near and Far Fields
Tatchyn, R.; Dec. 2005; 8 pp.; In English
Report No.(s): DE2006-876446; SLAC-PUB-11602; No Copyright; Avail.: Department of Energy Information Bridge
The unusually long insertion devices being prepared for Angstrom-wavelength Free Electron Lasers (FELs) will generate

spectral-angular distributions in the proposed experimental areas substantially different from those conventionally calculated for the far field. In this paper we report on computational simulations of near vs. far field distributions for the SLAC linac Coherent Light Source (LCLS) undulator, an insertion device approximately 140 meters long. The properties of the coherent radiation as a limiting case of the near-field emission, for the special condition of a microbunched beam radiating along the undulator axis, are reviewed.
NTIS
Angular Distribution; Coherent Light; Far Fields; Light Sources; Linear Accelerators; Near Fields; Particle Accelerators; Spectra

20060022708 Stanford Linear Accelerator Center, Stanford, CA, USA
Ultra-Fast Pump-Probe Detection Using Plasmas
Tatchyn, R.; Dec. 2005; 8 pp.; In English
Report No.(s): DE2006-876445; SLAC-PUB-11603; No Copyright; Avail.: Department of Energy Information Bridge
The temporal resolution of pump-flash interactions in the femtosecond-attosecond (fs-as) regime is limited by the characteristic time constants of the excited states in the detector material. If the relaxation time constant is appreciably longer that the time interval between the pump and probe signals the response of the detector material to the probe represents a temporal convolution with the pump and probe responses, setting a lower limit on the resolution to which the interval between the two pulses can be measured. In most of the solid state ultrafast detection schemes that are being considered for the ultrashort pulse x-ray sources under current development at SLAC and elsewhere the characteristic time constants are related to the bound states of the atoms comprising the material or to the relaxation times of phase transitions or charge carrier populations of the lattice, setting a probable lower limit on the attainable resolution on the order of (approx)0.1 ps. In this paper we consider a novel detection principle based on the excitation of specially prepared unbound states in an ionized plasma with high pump and probe fields, and estimate its potential for extending the lower limit of resolution into the attosecond (as) regime.
NTIS
Particle Accelerators; Plasmas (Physics)

20060022709 University of Southern California, Los Angeles, CA USA, Stanford Linear Accelerator Center, Stanford, CA, USA
Beam Matching to a Plasma Wake Field Accelerator Using a Ramped Density Profile at the Plasma Boundary
Marsh, K. A.; Clayton, C. E.; Johnson, D. K.; Huang, C.; May 2005; 8 pp.; In English
Report No.(s): DE2006-876443; SLAC-PUB-11643; No Copyright; Avail.: Department of Energy Information Bridge
An important aspect of plasma wake field accelerators (PWFA) is stable propagation of the drive beam. In the under dense plasma regime, the drive beam creates an ion channel which acts on the beam as a strong thick focusing lens. The ion channel causes the beam to undergo multiple betatron oscillations along the length of the plasma. There are several advantages if the beam size can be matched to a constant radius. First, simulations have shown that instabilities such as hosing are reduced when the beam is matched. Second, synchrotron radiation losses are minimized when the beam is matched. Third, an initially matched beam will propagate with no significant change in beam size in spite of large energy loss or gain. Coupling to the plasma with a matched radius can be difficult in some cases. This paper shows how an appropriate density ramp at the plasma entrance can be useful for achieving a matched beam. Additionally, the density ramp is helpful in bringing a misaligned trailing beam onto the drive beam axis. A plasma source with boundary profiles useful for matching has been created for the E-164X PWFA experiments at SLAC.
NTIS
Boundaries; Particle Accelerators; Plasma Accelerators; Plasmas (Physics); Wakes

20060022710 Stanford Univ., Stanford, CA USA, Stanford Linear Accelerator Center, Stanford, CA, USA
First Observation of Laser-Driven Acceleration of Relativistic Electrons in a Semi-Infinite Vacuum Space
Plettner, T.; Byer, R. L.; Smith, T. I.; Colby, E.; Cowan, B.; January 2006; 8 pp.; In English
Report No.(s): DE2006-876442; SLAC-PUB-11647; No Copyright; Avail.: National Technical Information Service (NTIS)
We have observed acceleration of relativistic electrons in vacuum driven by a linearly polarized visible laser beam incident on a thin gold-coated reflective boundary. The observed energy modulation effect follows all the characteristics expected for linear acceleration caused by a longitudinal electric field. As predicted by the Lawson-Woodward theorem the laser driven modulation only appears in the presence of the boundary. It shows a linear dependence with the strength of the

electric field of the laser beam and also it is critically dependent on the laser polarization. Finally, it appears to follow the expected angular dependence of the inverse transition radiation process experiment as the Laser Electron Accelerator Project (LEAP).
NTIS
High Energy Electrons; Lasers; Particle Accelerators; Relativistic Particles; Vacuum

20060022711 Stanford Linear Accelerator Center, Stanford, CA, USA
Optical Phase Locking of Modelocked Lasers for Particle Accelerators
Plettner, T.; Sinha, S.; Wisdom, J.; Colby, E.; January 2006; 8 pp.; In English
Report No.(s): DE2006-876441; SLAC-PUB-11648; No Copyright; Avail.: Department of Energy Information Bridge

Particle accelerators require precise phase control of the electric field through the entire accelerator structure. Thus a future laser driven particle accelerator will require optical synchronism between the high-peak power laser sources that power the accelerator. The precise laser architecture for a laser driven particle accelerator is not determined yet, however it is clear that the ability to phase-lock independent modelocked oscillators will be of crucial importance. We report the present status on our work to demonstrate long term phaselocking between two modelocked lasers to within one degree of optical phase and describe the optical synchronization techniques that we employ.
NTIS
Laser Mode Locking; Locking; Particle Accelerators

20060022721 Stanford Linear Accelerator Center, Stanford, CA, USA
Advances in Electromagnetic Modelling Through High Performance Computing
Ko, K.; Folwell, N.; Ge, L.; Guetz, A.; Lee, L.; Mar. 2006; 10 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2006-878342; SLAC-PUB-11789; No Copyright; Avail.: National Technical Information Service (NTIS)

Under the DOE SciDAC project on Accelerator Science and Technology, a suite of electromagnetic codes has been under development at SLAC that are based on unstructured grids for higher accuracy, and use parallel processing to enable large-scale simulation. The new modelling capability is supported by SciDAC collaborations on meshing, solvers, refinement, optimization and visualization. These advances in computational science are described and the application of the parallel eigensolver Omega3P to the cavity design for the International Linear Collider is discussed.
NTIS
Particle Accelerators; Unstructured Grids (Mathematics); Cavities

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20060022072 Lulea Univ., Sweden
A Requirements Management Approach Supporting Integrated Health Management System Design
Soderholm, Peter; International Journal of COMADEM, Vol. 9, No. 2; April 2006, pp. 2-13; In English; See also 20060022069
Contract(s)/Grant(s): Proj. NFFP2-481; Copyright; Avail.: Other Sources

Systems Health Management is an approach that is intended to improve the dependability and safety of technical systems, and to decrease the combined cost of operation and support. These benefits may be achieved through the application of monitoring, diagnostics, and prognostics technologies. However, in order to achieve the potential benefits of Health Management, it is necessary to combine stakeholder requirements with a thorough engineering knowledge. The aim of this paper is to present a systemic, systematic, and stakeholder-centered Requirements Management approach that supports the design of an Integrated Health Management (IHMS). The approach establishes traceability between stakeholder requirements and critical system functions that should be covered by monitoring and test capabilities. Thereby the approach supports verification and validation of stakeholder requirements as well as continuous improvements of the technical system. A holistic management model intended to increase stakeholder satisfaction with a reduced amount of resources is also presented. The

approach and its application are highlighted and exemplified through experiences from a single-case study related to a modern combat aircraft, which is a highly complex and critical technical system.
Author
Management Systems; Health; Systems Management; Systems Engineering; Complex Systems

82
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer program documentation see *61 Computer Programming and Software*.

20060021584 Kentucky Univ., Lexington, KY USA
Evaluation of the Eastern Kentucky Rural Highway Information Project 511 Tourism Service
Yusuf, J. E.; Wallace, C. Y.; Kreis, S. D.; May 2006; 62 pp.; In English
Report No.(s): PB2006-110484; KTC-06-10/RS-F2-03-1F; No Copyright; Avail.: CASI: A04, Hardcopy

The purpose of this study is to provide an evaluation of the Eastern Kentucky Rural Highway Information Project, involving the establishment of a 511 Premium Tourism Service Package. Kentucky is only the second state to offer tourism related services through its 511 Travel System, placing the state in a position to offer insights gained from the project to other states considering the implementation of a similar program. Lessons learned from Kentucky's experience with launching and managing a multi- county tourism information system will be invaluable. To that end, this study (1) reviewed the activities undertaken during launch and early operations of the Southern and Eastern Kentucky 511 Tourism Service, and (2) conducted a survey of users in an effort to gauge public use and receptiveness to this service. This report offers lessons learned during the start-up phase of the project pertaining to (1) institutional issues, (2) technical issues, and (3) public-private partnership issues. In addition, a survey was administered to 600 users of the 511 Tourism Service, in an effort to gauge current public sentiment about the service as well as discover additional features users would like the service to offer in the future.
NTIS
Highways; Information Systems; Kentucky; Tourism

20060021612 National Center for Education Statistics, Washington, DC, USA
U.S. Student and Adult Performance on International Assessments of Educational Achievement: Findings from the Condition of Education 2006
Lemke, M.; Gonzales, P.; Jun. 2006; 40 pp.; In English
Report No.(s): PB2006-112103; NCES-2006-073; No Copyright; Avail.: CASI: A03, Hardcopy

As part of its congressional mandate, the National Center for Education Statistics (NCES) is required to report on the state of education in the USA and other countries (Education Sciences Reform Act of 2002). To carry out this mission, NCES engages in a number of activities designed to gather information and produce indicators on how the performance of U.S. students, teachers, and schools compares with that of their counterparts in other countries. NCES and other offi ces within the U.S. Department of Education work with foreign ministries of education and international organizations, such as the Organization for Economic Cooperation and Development (OECD), the International Association for the Evaluation of Educational Achievement (IEA), and the United Nations Educational, Scientifi c and Cultural Organization (UNESCO) to plan, develop, and implement reliable and meaningful measures across countries.
NTIS
Adults; Education; Organizations; Students; United States

20060021618 Florida Univ., Gainesville, FL, USA
New Database Framework for Florida's Transportation Planning: Integrating Work Program, Mulitmodal Transportation Networks, Planning and Environmental Databases
Bejleri, I.; Kim, K.; Yang, X.; Feb. 2006; 82 pp.; In English
Contract(s)/Grant(s): BD545-11
Report No.(s): PB2006-111468; No Copyright; Avail.: National Technical Information Service (NTIS)

At present, the transportation planning databases, transportation networks and applications associated with the FDOT WPA, RCI, FIHS-DSS, FSUTMS, FGDL, ETDM, and SIS are not fully integrated in a connected GIS environment which impedes the efficient exchange of information in transportation planning. The goal of theis research was to develop a database

framework that establishes connections among the transportation planning databases in order to facilitate data sharing and exchange.
NTIS
Data Bases; Florida; Planning; Project Planning; Transportation; Transportation Networks

20060021628 MPR Associates, Inc., Washington, DC, USA, National Center for Education Statistics, Washington, DC, USA
Student Financing of Graduate and First-Professional Education, 2003-04. Profiles of Students in Selected Degree Programs and Part-Time Students
Choy, S. P.; Cataldi, E. F.; Griffith, J.; Jun. 2006; 198 pp.; In English
Report No.(s): PB2006-112844; NCES-2006-185; No Copyright; Avail.: CASI: A09, Hardcopy

During the 2003-04 academic year, approximately 2.8 million students were enrolled in a graduate or first-professional program.1 This report uses data from the 2003-04 National Postsecondary Student Aid Study (NPSAS:04) to profile graduate and first-professional students and describe how they use financial aid and work to pay for their education. NPSAS is a nationally representative survey of all students enrolled in postsecondary institutions, including undergraduate, graduate, and first-professional students. The data cover students in the 50 states, the District of Columbia, and Puerto Rico. This report is the sixth in a series of reports on graduate and first-professional students issued following the release of a new NPSAS survey. Its purpose is to provide a snapshot of graduate and first-professional students and how they finance their education and to provide a useful reference tool for federal and state policymakers, college administrators, and others seeking detailed information on financial aid.
NTIS
Education; Students; Surveys; Finance

20060021661 Organization for Industrial Research, Inc., Waltham, MA USA
The National Shipbuilding Research Program. Proceedings of the IREAPS Technical Symposium. Paper No. 25: Classification and Coding: A Tool to Organize Information . Volume 1
Houtzeel, Alexander; Sep 1982; 28 pp.; In English
Report No.(s): AD-A447702; NSRP-0009; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447702; Avail.: CASI: A03, Hardcopy

The uses of classification and coding as a tool to integrate computer aided design and manufacturing are described. The information revolution has created an enormity of data which is increasingly difficult to access. In recent years, companies have turned to classification and coding systems as a means of organizing raw data and retrieving useful relevant information. Essentially, classification is a means of separating raw information into classes of similar information; coding is a means of retrieving the information so that it can be analyzed and applied to accomplish specific objectives. The MULTICLASS system enables the user to employ multiple coding systems that can be used for various information retrieval and analysis purposes i.e., retrieval and
DTIC
Classifications; Conferences; Information Retrieval; Marine Technology; Ships

20060021731 Aerospace Corp., El Segundo, CA USA
Investigation of CONOPS for ISR and Weapon Systems in Missions against Targets Employing Deceptive Tactics
Maillard, William; Jun 23, 2005; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447834; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447834; Avail.: CASI: A03, Hard-copy

Survey Concealment, Camouflage and Deception (CCD) techniques and approaches to modeling them. Represent characteristics and first order effects of CCD techniques in the SEAS theater level model. Support training in Military Utility Analysis methods and tools as part of IR & D. Investigate the potential contributions of advanced ISR and weapon systems to the engagement of TBM target elements employing CCD tactics.
DTIC
Deception; Models; Tactics; Targets; Weapon Systems

20060021751 General Dynamics Corp., Groton, CT USA
Crosscut Resource Center Preliminary Operational Model. Change 1
Aug 28, 2000; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-2000928
Report No.(s): AD-A447869; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447869; Avail.: CASI: A03, Hardcopy

The National Shipbuilding Research Program (NSRP) Advanced Shipbuilding Enterprise Strategic Investment Plan recognizes the importance of addressing people and organizational issues in revitalizing the U.S. shipbuilding and ship repair industry. This recognition is reflected in the creation of the Crosscut initiative. Education/training, organizational change, human resources, and technology transfer are identified as key elements impacting the successful implementation of industry change. These requirements cut across all of the major initiatives in the Advanced Shipbuilding Enterprise (ASE) program. Often, however, these crosscut elements and their potential impact are not well understood or accommodated by industry personnel responsible for developing or implementing shipyard technological or process changes. To meet this educational need, a team of six U.S. shipyards and one university was created to design a virtual resource center for crosscut needs. This Preliminary Operational Model summarizes the plans and approach for operating and maintaining the Crosscut Resource Center during the Crosscut Resource Center project. The Model has six sections and an appendix: Introduction, Reference Documents, Crosscut Resource Center Description, Crosscut Resource Center Management, Crosscut Resource Center Policies, Crosscut Resource Center Operation and Maintenance, and Appendix A - Purposes of Crosscut Resource Center Services.
DTIC
Marine Technology; Ships; Technology Transfer

20060021752 Avondale Shipyards, Inc., New Orleans, LA USA
Resource Center for Crosscut Initiatives Final Report
Apr 28, 2000; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447870; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447870; Avail.: CASI: A03, Hardcopy

A collaborative team consisting of Electric Boat Corporation, Avondale Industries, Bath Iron Works Corporation, Cascade General, National Steel and Shipbuilding Company, Todd Pacific Shipyards Corporation, and the University of Michigan Transportation Research Institute submitted a proposal to design and develop a resource center for crosscut initiatives. The proposed resource center would focus on the support required for addressing the people and organization needs important to the revitalization of the shipbuilding and ship repair industry. These needs cut across the industry and include education and training, organizational change, human resources, and technology transfer. The resource center would focus on assisting industry professionals from the crosscut areas, personnel from MARITECH-ASE projects, and professionals from other industries. The purpose of this final report is to describe the activities that have taken place in the past eight months relative to the World Class Resource Center for Crosscut Initiatives.
DTIC
Marine Technology; Ships; Technology Transfer

20060021832 Military Academy, West Point, NY USA
Finding the Right Terrain Database
Martin, Grant; Schamburg, Jeffrey; Kwinn, Jr, Michael J; Jun 23, 2005; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447940; No Copyright; Avail.: CASI: A03, Hardcopy

PURPOSE: To describe the methodology used to define the metadata for use in the Army Digital Terrain Library (ADTL). REVISED PROBLEM STATEMENT: Determine the essential metadata and significant functions that allow for efficient retrieval and organization of modeling and simulation terrain databases.
DTIC
Data Bases; Libraries; Terrain

20060021854 Maryland Univ., College Park, MD USA
A Hierarchical Task-Network Planner Based on Symbolic Model Checking
Kuter, Ugur; Nau, Dana; Pistore, Marco; Traverso, Paolo; Jan 2005; 11 pp.; In English
Contract(s)/Grant(s): IIS0412812
Report No.(s): AD-A447974; No Copyright; Avail.: CASI: A03, Hardcopy

Although several approaches have been developed for planning in non-deterministic domains, solving large planning problems is still quite difficult. In this work, we present a novel algorithm, called YoYo, for planning in non- deterministic domains under the assumption of full observability. This algorithm enables us to combine the power of search-control strategies as in Planning with Hierarchical Task Networks (HTNs) with techniques from the Planning via Symbolic Model-Checking (SMC). Our experimental evaluation confirms the potentialities of our approach, demonstrating that it combines the advantages of these paradigms.
DTIC
Networks; Planning

20060021876 Library of Congress, Washington, DC USA
Intelligence Reform and Terrorism Prevention Act of 2004: National Standards for Drivers' Licenses, Social Security Cards, and Birth Certificates
Tatelman, Todd B; Jan 6, 2005; 14 pp.; In English
Report No.(s): AD-A448018; CRS-RL32722; No Copyright; Avail.: CASI: A03, Hardcopy

In its comprehensive report to the nation, the National Commission on Terrorist Attacks Upon the USA (9/11 Commission) recommended that the Federal Government set national standards for the issuance of identification documents, including drivers' licenses, social security cards, and birth certificates. The Commission noted that identification fraud is no longer simply a matter of theft, but now complicates the government's ability to adequately ensure public safety at vulnerable facilities such as airport terminals, train stations, bus stations, and other entry points. As the legislative process unfolded, both the House of Representatives' and the Senate's proposed versions of legislation included provisions intended to address this specific recommendation. However, their approaches varied both with respect to scope and to the methodology that was to be used to bring the states into conformity with these new national standards. Generally, the House version opted to detail specific statutory requirements while the Senate proposal chose to mandate regulation, but delegated broad discretionary authority to the relevant federal agencies. The final legislation that was approved by Congress on December 8, 2004, and signed by the President on December 17, 2004, contained many of the provisions found in the Senate's original proposal with several significant additions from the House's proposed language. Many of the provisions that were considered controversial were not ultimately included, however, several Members indicated during the floor debate that these issues, specifically those that relate to drivers' licenses, would be revisited during the 109th Congress. In addition, because many of these provisions only delegate regulatory authority to federal agencies, several concerns that were raised during the legislation's deliberation, including access to birth certificates by genealogists or other researchers, are not specifically addressed by the statute.
DTIC
Birth; Intelligence; Law (Jurisprudence); Prevention; Security; Terrorism; United States

20060021887 Army War Coll., Carlisle Barracks, PA USA
Strategic Planning by the Chairmen, Joint Chiefs of Staff, 1990 to 2005
Meinhart, RIchard; Apr 2006; 37 pp.; In English
Report No.(s): AD-A448043; No Copyright; Avail.: CASI: A03, Hardcopy

Military leaders at many levels have used strategic planning in various ways to position their organizations to respond to the demands of the current situation, while simultaneously focusing on future challenges. This Letort Paper examines how four Chairmen Joint Chiefs of Staff from 1990 to 2005 used a strategic planning system to enable them to meet their statutory responsibilities specified in Title 10 US Code and respond to the ever-changing strategic environment. These responsibilities include: assisting the President and Secretary of Defense in providing strategic direction to the armed forces; conducting strategic planning and net assessments to determine military capabilities; preparing contingency planning and assessing preparedness; and providing advice on requirements, programs, and budgets. The Chairman's strategic planning system is a primary and formal way he executes these responsibilities as this system creates products to integrate defense processes and influence others related to assessment, vision, strategy, resources, and plans. This planning system integrates the processes and documents of the people and organizations above the Chairman, which are the President and Secretary of Defense, and the people and organizations he directly coordinates with, which primarily are the different military services and combatant commanders. In addition to influencing the nation's senior leaders, this system provides specific direction for many staffs that support these leaders. As such, this planning system is a key process that integrates the Nation's military strategy, plans, and resources that consist of approximately 2.24 million active, guard, and reserve forces and total defense outlays of $465B by 2005.
DTIC
Leadership; Management Planning; Military Operations; Planning; Security; Strategy

20060021954 Defence Research and Development Suffield, Suffield, Alberta Canada

Analysis of Chemical Warfare Agents: General Overview, LC-MS Review, In-House LC-ESI-MS Methods and Open Literature Bibliography

D'Agostino, Paul A; Chenier, C L; Mar 2006; 90 pp.; In English; Original contains color illustrations

Report No.(s): AD-A447831; DRDC-S-TR-2006-022; No Copyright; ONLINE: http://hdl.handle.net/100.2/ADA447831; Avail.: CASI: A05, Hardcopy

Ratification of the Chemical Weapons Convention by more than 165 States Parties has reduced the risk of chemical warfare agent use, but there still remains a concern that other parties may make use of these weapons against civilian or military targets. Concerns within the defense and homeland security communities over possible terrorist use as well as the requirements for a verifiable Chemical Weapons Convention have driven the development of analytical methods such as liquid chromatography-mass spectrometry (LC-MS) for the detection and identification of chemical warfare agents. This paper provides a general overview of chemical warfare agents and analytical methods for their analysis, a focused review of LC-MS applications, a summary of in-house LC-MS methods developed at DRDC Suffield, and a comprehensive bibliography of analytical open literature papers dealing with chemical warfare agent detection and identification. The review sections provide the homeland security and defense communities with an overview of chemical warfare agents and analytical methods for their determination. Researchers interested in developing new methods for chemical warfare agents may use the reviewed material to quickly ascertain the state of development of analytical methods, in particular LC-MS methods, for chemical warfare agents. The reviewed materials will be used for reference purposes during the development of high field asymmetric waveform ion mobility spectrometry (FAIMS) mass spectrometry, a new analytical technique with the potential to rapidly separate and identify chemical warfare agents. The report concludes with 67 references. Appendix A is a 454-item bibliography of open literature analytical methods for the detection and identification of chemical warfare agents, their degradation products, and related compounds. Paper copies of each paper are held at DRDC Suffield and this comprehensive database of methods continues to be updated regularly using Procite software.

DTIC

Bibliographies; Chemical Warfare; General Overviews; Liquid Chromatography; Mass Spectroscopy

20060021983 Defense Acquisition Univ., Fort Belvoir, VA USA

The Foreign Intelligence Surveillance Act: An Overview of the Statutory Framework and Recent Judicial Decisions

Bazan, Elizabeth B; Apr 21, 2005; 92 pp.; In English

Report No.(s): AD-A447938; No Copyright; Avail.: CASI: A05, Hardcopy

The Foreign Intelligence Surveillance Act, 50 U.S.C. 1801 et seq., (FISA) as passed in 1978, provided a statutory framework for the use of electronic surveillance in the context of foreign intelligence gathering. In so doing, the Congress sought to strike a delicate balance between national security interests and personal privacy rights. Subsequent legislation expanded federal laws dealing with foreign intelligence gathering to address physical searches, pen registers and trap and trace devices, and access to certain business records. The Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism (USA PATRIOT) Act of 2001, P.L. 107-56, made significant changes to some of these provisions. Further amendments were included in the Intelligence Authorization Act for Fiscal Year 2002, P.L. 107-108, and the Homeland Security Act of 2002, P.L. 107-296, and the Intelligence Reform and Terrorism Prevention Act, P.L. 108-458. In addressing international terrorism or espionage, the same factual situation may be the focus of both criminal investigations and foreign intelligence collection efforts. Changes in FISA under these public laws are intended to facilitate information sharing between law enforcement and intelligence elements. In its Final Report, the 9/11 Commission noted that the removal of the pre-9/11 wall between intelligence and law enforcement has opened up new opportunities for cooperative action within the FBI.

DTIC

Electronic Equipment; Intelligence; Law (Jurisprudence); Security; Surveillance

20060022198 Maryland Univ., College Park, MD USA

Applications of SHOP and SHOP2

Nau, Dana; Au, Tsz-Chiu; Ilghami, Okhtay; Kuter, Ugur; Munoz-Avila, Hector; Murdock, J W; Wu, Dan; Yaman, Fusun; Dec 12, 2004; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-00-2-0505; DAAL01-97-K-0135

Report No.(s): AD-A447982; No Copyright; Avail.: CASI: A03, Hardcopy

SHOP and SHOP2 are HTN planning systems that were designed with two goals in mind: to investigate some research issues in automated planning, and to provide some simple, practical planning tools. They are available as open-source

software, and have developed an active base of users in government, industry, and universities. SHOP2 received one of the top four awards in the 2002 International Planning Competition. This paper summarizes how SHOP and SHOP2 work, describes some of the applications that users have developed for them, and discusses directions for future work.
DTIC
Planning; Open Source Licensing (Computers); Automation

20060022199 Maryland Univ., College Park, MD USA
Applications of SHOP and SHOP2
Nau, Dana; Au, Tsz-Chiu; Ilghami, Okhtay; Kuter, Ugur; Munoz-Avila, Hector; Murdock, J W; Wu, Dan; Yaman, Fusun; Jun 25, 2004; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-2-0505; DAAL01-97-K-0135
Report No.(s): AD-A447977; No Copyright; Avail.: CASI: A03, Hardcopy

SHOP and SHOP2 are HTN planning systems that were designed with two goals in mind: to investigate some research issues in automated planning, and to provide some simple, practical planning tools. They are available as freeware, and have developed an active base of users in government laboratories, industrial R&D projects, and academic settings. This paper summarizes how SHOP and SHOP2 work, describes some of the applications that we and others have developed for them, and discusses directions for future research and enhancements.
DTIC
Planning; Automation

20060022249 Maryland Univ., College Park, MD USA
Information Gathering During Planning for Web Service Composition
Kuter, Ugur; Sirin, Evren; Nau, Dana; Parsia, Bijan; Hendler, James; Jan 2006; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-2-0505; DAAL01-97-K-0135
Report No.(s): AD-A448050; No Copyright; Avail.: CASI: A03, Hardcopy

Hierarchical Task-Network (HTN) based planning techniques have been applied to the problem of composing Web Services, especially when described using the OWL-S service ontologies. Many of the existing Web Services are either exclusively information providing or crucially depend on information-providing services. Thus, many interesting service compositions involve collecting information either during execution or during the composition process itself. In this paper, we focus on the latter issue. In particular, we present ENQUIRER, an HTN-planning algorithm designed for planning domains in which the information about the initial state of the world may not be complete, but it is discoverable through plan-time information-gathering queries. We have shown that ENQUIRER is sound and complete, and derived several mathematical relationships among the amount of available information, the likelihood of the planner finding a plan, and the quality of the plan found. We have performed experimental tests that confirmed our theoretical results and that demonstrated how ENQUIRER can be used in Web Service composition.
DTIC
Information Theory; Internets; Internet Resources

20060022525 Maryland Univ., College Park, MD USA
Groundtruth Generation and Document Image Degradation
Zi, Gang; May 2005; 73 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): MDA904-02-C-0406
Report No.(s): AD-A447997; No Copyright; Avail.: CASI: A04, Hardcopy

The problem of generating synthetic data for the training and evaluation of document analysis systems has been widely addressed in recent years. With the increased interest in processing multilingual sources, however, there is a tremendous need to be able to rapidly generate data in new languages and scripts, without the need to develop specialized systems. We have developed a system, which uses language support of the MS Windows operating system combined with custom print drivers to render tiff images simultaneously with windows Enhanced Metafile directives. The metafile information is parsed to generate zone, line, word, and character ground truth including location, font information and content in any language supported by Windows. The resulting images can be physically or synthetically degraded by our degradation modules, and used for training and evaluating Optical Character Recognition (OCR) systems. Our document image degradation methodology incorporates several often-encountered types of noise at the page and pixel levels. Examples of OCR evaluation

and synthetically degraded document images are given to demonstrate the effectiveness.
DTIC
Degradation; Ground Truth; Training Evaluation; Information

20060022527 Maryland Univ., College Park, MD USA
SMORE -Semantic Markup, Ontology, and RDF Editor
Kalyanpur, Aditya; Hendler, James; Parsia, Bijan; Golbeck, Jennifer; Jan 2006; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A447989; No Copyright; Avail.: CASI: A02, Hardcopy

The promise of the Semantic Web is founded on the principle that online content will be semantically annotated, creating machine-understandable content using interlinking ontologies. In keeping with this principle, we introduce SMORE, the Semantic Markup, Ontology, and RDF Editor. It provides users with an integrated environment for creating web pages, email, and other online content while facilitating inline, seamless semantic markup. The rich features of SMORE extend its capabilities beyond that of other annotation tools available. For instance, in addition to combining content creation and annotation, SMORE allows users to mark up parts of images using SVG. Users also have a number of options to collect information from the web, including an advanced ontology search capability, web scraping, and a semantic Virtual portal that provides links to semantically related material. This, combined with the unique ability to defer markup using place holders, use and extend multiple ontologies, infer classification for ad hoc objects, and interlink concepts makes SMORE a unique tool that will benefit both users and the future of the semantic web.
DTIC
Semantics; Document Markup Languages

84
LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes aviation law; space law and policy; international law; international cooperation; and patent policy.

20060022226 Library of Congress, Washington, DC USA
The SAFE Acts of 2005: H.R. 1526 and S. 737 -- A Sketch
Doyle, Charles; May 9, 2005; 7 pp.; In English
Report No.(s): AD-A447951; CRS-RS22140; No Copyright; Avail.: CASI: A02, Hardcopy

Somewhat different SAFE Acts have been introduced in both the House and Senate: S. 737, the Security and Freedom Enhancement Act of 2005 (introduced by Senator Craig) and H.R. 1526, the Security and Freedom Ensured Act of 2005 (introduced by Representative Otter). Although the Senate bill is more detailed, they address many of the same issues, most of which relate to the USA PATRIOT Act -- roving Foreign Intelligence Surveillance Act (FISA) wiretaps, delayed notification of 'sneak and peek' search warrants, library and similar exemptions from FISA tangible item orders and communications related to national security letters, the definition of 'domestic terrorism,' and expansion of the sunset provisions of the USA PATRIOT Act. This report is an abridged version -- without footnotes and citations -- of CRS Report RL32907, Security and Freedom Ensured Act of 2005 (SAFE Act) (H.R. 1526) and Security and Freedom Enhancement Act of 2005 (SAFE Act) (S. 737): Section by Section Analysis.
DTIC
Augmentation; Electronic Warfare; Intelligence; Law (Jurisprudence); Privacy; Protection; Security; Surveillance

20060022523 Library of Congress, Washington, DC USA
Foreign Intelligence Surveillance Act: Selected Legislation from the 108th Congress
Bazan, Elizabeth B; Jan 11, 2005; 20 pp.; In English
Report No.(s): AD-A448020; CRS-RL32608; No Copyright; Avail.: CASI: A03, Hardcopy

The Foreign Intelligence Surveillance Act, 50 U.S.C. 1801 (FISA) as passed in 1978, provided a statutory framework for the use of electronic surveillance in the context of foreign intelligence gathering. In so doing, Congress sought to strike a delicate balance between national security interests and personal privacy rights. Subsequent legislation expanded federal laws dealing with foreign intelligence gathering to address physical searches, pen registers, trap and trace devices, and access to certain business records. The Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism (USA PATRIOT) Act of 2001, P.L. 107-56, made significant changes to some of these provisions. Further amendments to FISA were included in the Intelligence Authorization Act for Fiscal Year 2002, P.L. 107-108, and the

Homeland Security Act of 2002, P.L. 107-296. In addressing international terrorism or espionage, the same factual situation may be the focus of both criminal investigations and foreign intelligence collection efforts. The changes in FISA under these public laws facilitate information sharing between law enforcement and intelligence elements. In 'The 9/11 Commission Report, Final Report of the National Commission on Terrorist Attacks upon the USA' (W. W. Norton 2004), the 9/11 Commission noted that the removal of the pre-9/11 'wall' between intelligence and law enforcement 'has opened up new opportunities for cooperative action within the FBI.' In the 108th Congress, a number of intelligence reform bills were introduced, including some which pre-dated the release of the Final Report of the 9/11 Commission, while others emerged after its release. This CRS Report describes 11 FISA provisions that are part of intelligence reform or reorganization proposals, and 20 other FISA-related bills in the 108th Congress.
DTIC
Electronic Warfare; Intelligence; Law (Jurisprudence); Surveillance; United States

85
TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety, 16 Space Transportation and Safety*, and *44 Energy Production and Conversion*. For specific technology transfer applications see also the category where the subject is treated.

20060021580 National Renewable Energy Lab., Golden, CO USA, Battelle Memorial Inst., Columbus, OH USA
New York City Transit Hybrid and CNG Transit Buses: Interim Evaluation Results
Chandler, K.; Eberts, E.; Eudy, L.; Jan. 2006; 68 pp.; In English
Report No.(s): DE2006-875767; NREL/TP-540-38843; No Copyright; Avail.: Department of Energy Information Bridge

This report is part of a series of evaluations from the U.S. Department of Energy (DOE). DOE, through the National Renewable Energy Laboratory (NREL), has been tracking and evaluating new propulsion systems in transit buses and trucks for more than 10 years using an established and documented evaluation protocol. DOE/NREL evaluated the original 10 prototype diesel hybrid buses from Orion and BAE Systems (model Orion VI buses) operated at New York City Transit (NYCT). That evaluation was reported in July 2002 and provided results from the prototype buses from 1998 through 2001. These DOE/NREL vehicle evaluations are a part of the Advanced Vehicle Testing Activity (AVTA), which supports DOE's FreedomCAR & Vehicle Technologies Program. The role of AVTA is to bridge the gap between research and development and commercial availability of advanced vehicle technologies that reduce U.S. petroleum use while improving air quality. The main objective of AVTA projects is to provide comprehensive, unbiased evaluations of advanced technologies. Data collected and analyzed include the operation, maintenance, performance, safety, cost, and emissions characteristics of advanced technology fleets and comparable conventional technology fleets operating at the same site. By comparing available advanced and conventional technology vehicles, AVTA evaluations help fleet owners and operators make informed purchasing decisions. This report focuses on compressed natural gas (CNG) and diesel hybrid electric bus propulsion systems in NYCT's transit buses. Both of these propulsion systems are alternatives to standard diesel buses and allow for reductions in petroleum use and emissions (usually focused on reductions of particulate matter and oxides of nitrogen). CNG propulsion is an alternative to diesel fuel use, and diesel hybrid propulsion allows for increased fuel economy, which, in turn, is a reduction in petroleum use.
NTIS
Compressed Gas; Electric Motor Vehicles; Natural Gas; Propulsion System Configurations; Propulsion System Performance; Hybrid Propulsion

88
SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

20060021604 NASA Johnson Space Center, Houston, TX, USA
Exploration Requirements Development Utilizing the Strategy-to-Task-to-Technology Development Approach
Drake, Bret G.; Josten, B. Kent; Monell, Donald W.; [2004]; 10 pp.; In English; AIAA Space 2004 Conference, 28-30 Sep. 2004, San Diego, CA, USA; Original contains black and white illustrations
Contract(s)/Grant(s): 905-10-AF
Report No.(s): AIAA Paper 2004-5928; No Copyright; Avail.: CASI: A02, Hardcopy

The Vision for Space Exploration provides direction for the National Aeronautics and Space Administration to embark on a robust space exploration program that will advance the Nation s scientific, security, and economic interests. This plan calls for a progressive expansion of human capabilities beyond low earth orbit seeking to answer profound scientific and philosophical questions while responding to discoveries along the way. In addition, the Vision articulates the strategy for developing the revolutionary new technologies and capabilities required for the future exploration of the solar system. The National Aeronautics and Space Administration faces new challenges in successfully implementing the Vision. In order to implement a sustained and affordable exploration endeavor it is vital for NASA to do business differently. This paper provides an overview of the strategy-to-task-to-technology process being used by NASA s Exploration Systems Mission Directorate to develop the requirements and system acquisition details necessary for implementing a sustainable exploration vision.
Author
Space Exploration; Human Performance; NASA Programs; Low Earth Orbits; Commerce

20060022162 NASA Johnson Space Center, Houston, TX, USA
Calculating Statistical Orbit Distributions Using GEO Optical Observations with the Michigan Orbital Debris Survey Telescope (MODEST)
Matney, M.; Barker, E.; Seitzer, P.; Abercromby, K. J.; Rodriquez, H. M.; [2006]; 1 pp.; In English; 57th International Astronautical Congress, 2-6 Oct. 2006, Valencia, Spain; Copyright; Avail.: Other Sources; Abstract Only

NASA's Orbital Debris measurements program has a goal to characterize the small debris environment in the geosynchronous Earth-orbit (GEO) region using optical telescopes ('small' refers to objects too small to catalog and track with current systems). Traditionally, observations of GEO and near-GEO objects involve following the object with the telescope long enough to obtain an orbit suitable for tracking purposes. Telescopes operating in survey mode, however, randomly observe objects that pass through their field of view. Typically, these short-arc observation are inadequate to obtain detailed orbits, but can be used to estimate approximate circular orbit elements (semimajor axis, inclination, and ascending node). From this information, it should be possible to make statistical inferences about the orbital distributions of the GEO population bright enough to be observed by the system. The Michigan Orbital Debris Survey Telescope (MODEST) has been making such statistical surveys of the GEO region for four years. During that time, the telescope has made enough observations in enough areas of the GEO belt to have had nearly complete coverage. That means that almost all objects in all possible orbits in the GEO and near- GEO region had a non-zero chance of being observed. Some regions (such as those near zero inclination) have had good coverage, while others are poorly covered. Nevertheless, it is possible to remove these statistical biases and reconstruct the orbit populations within the limits of sampling error. In this paper, these statistical techniques and assumptions are described, and the techniques are applied to the current MODEST data set to arrive at our best estimate of the GEO orbit population distribution.
Author
Earth Orbits; Geosynchronous Orbits; Space Debris; Statistical Analysis; Telescopes; Surveys; Statistical Distributions; Circular Orbits

20060022550 NASA Langley Research Center, Hampton, VA, USA
Overview of Boundary Layer Transition Research in Support of Orbiter Return To Flight
Berry, Scott A.; Horvath, Thomas J.; Greene, Francis A.; Kinder, Gerald R.; Wang, K. C.; [2006]; 12 pp.; In English; 9th AIAA/ASME Joint Thermophysics and Heat Transfer Conference, 5-8 Jun. 2006, San Francisco, CA, USA
Contract(s)/Grant(s): WBS 732759.07.05
Report No.(s): AIAA Paper 2006-2918; Copyright; Avail.: CASI: A03, Hardcopy

A predictive tool for estimating the onset of boundary layer transition resulting from damage to and/or repair of the thermal protection system was developed in support of Shuttle Return to Flight. The boundary layer transition tool is part of a suite of tools that analyze the aerothermodynamic environment to the local thermal protection system to allow informed disposition of damage for making recommendations to fly as is or to repair. Using mission specific trajectory information and details of each damage site or repair, the expected time (and thus Mach number) at transition onset is predicted to help define the aerothermodynamic environment to use in the subsequent thermal and stress analysis of the local thermal protection system and structure. The boundary layer transition criteria utilized for the tool was developed from ground-based measurements to account for the effect of both protuberances and cavities and has been calibrated against select flight data. Computed local boundary layer edge conditions were used to correlate the results, specifically the momentum thickness Reynolds number over the edge Mach number and the boundary layer thickness. For the initial Return to Flight mission, STS-114, empirical curve

coefficients of 27, 100, and 900 were selected to predict transition onset for protuberances based on height, and cavities based on depth and length, respectively.
Author
Boundary Layer Transition; Thermal Protection; Aerothermodynamics; Space Shuttle Orbiters; General Overviews; Research and Development

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20060022080 NASA Johnson Space Center, Houston, TX, USA
Optical Spectroscopy of Stardust Samples
Keller, Lindsay P.; [2006]; 1 pp.; In English; International Mineralogical Association, 22-28 Jul. 2006, Kobe, Japan; No Copyright; Avail.: Other Sources; Abstract Only

The Stardust spacecraft collected dust samples of the Kuiper belt comet 81P Wild-2 in aerogel and returned them to Earth January 15, 2006. Preliminary examination (PE) of the collected dust includes teams focused on mineralogy, chemical composition, isotopic measurements, organic analysis, cratering and spectroscopic properties. The main PE science goals are to provide an initial characterization of the returned samples with an emphasis on the capture process and its effects on the samples, a comparison of Stardust samples to other meteoritic materials, and the abundance of presolar materials in the Stardust samples. The science objectives of the Spectroscopy team are to obtain spectroscopic data on Stardust particles through infrared (IR), UV/Vis and Raman measurements of particles in aerogel, extracted particles, keystones, and microtome thin sections. These data will be used to answer fundamental science questions about the nature of the samples, but will also serve as preliminary mineralogical data to guide follow-on measurements that will be performed in the other preliminary examination teams. The IR characteristics of Stardust particles are measured to determine: 1) the nature of the indigenous 3.4 micron organic feature, is it detected and can it be differentiated/deconvolved from the contaminated aerogel? How does it compare to features observed in interplanetary dust particles (IDPs) and to astronomical measurements of comets and interstellar dust? 2) the shape and fine structure within the 10 micron silicate feature. Overlap with the strong Si-O stretching vibration from the aerogel complicates this analysis, but we hope to determine if the feature is dominated by amorphous silicates such as those observed in IDPs and comets and whether or not crystalline silicates (e.g. olivine, pyroxene, clays) are present, 3) the presence of secondary (alteration) phases. Deep Impact results suggest that IR observations of Stardust particles should be evaluated for the presence of hydrated materials (water bands at 3 and 6 microns) and carbonates (6.8 microns and other resonances) and 4) the detection of crystalline features in the far-IR (20-100 microns) region where crystalline silicates and other minerals have strong bands that can be used both for phase analysis and phase chemistry. It has been demonstrated that these far-IR measurements can be obtained in situ on particles in aerogel keystones.
Author
Stardust Mission; Kuiper Belt; Interplanetary Dust; Interstellar Matter; Spectroscopy; Wild 2 Comet; Infrared Astronomy; Mineralogy

20060022135 NASA Marshall Space Flight Center, Huntsville, AL, USA
Gamma-Ray Burst Associated Supernovae: Outliers Become Mainstream
Pian, E.; Mazzali, P.; Masetti, N.; Ferrero, P.; Klose, S.; Palazzi, E.; Ramirez-Ruiz, E.; Woosley, S. E.; Kouveliotou, C.; Deng, J., et al.; [2006]; 2 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

During the last eight years a clear connection has been established-between the two most powerful explosions in our Universe: core-collapse supernovae (SNe) and long gamma ray bursts (GRBs). Theory suggests4 that every GRB is simultaneously accompanied by a SN, but in only a few nearby cases have these two phenomena been observed together. We report the discovery and daily monitoring of SN 2006aj associated with the GRB 060218. Because the event was the second closest GRB, both explosions could be examined in detail. GRB 060218 had an unusually soft spectrum, long duration, and a total energy 100 to 1000 times less than most other GRBs. Yet SN 2006aj was similar to those in other GRBs, aside from rising more rapidly and being approximately 40% fainter. Taken together, these observations suggest that GRBs have two components: a broad, energetic, but only mildly relativistic outflow that makes a SN, and a more narrowly focused, highly relativistic jet responsible for the GRB. The properties of the GRB jet apparently vary greatly from event to event, while the

broad SN outflow varies much less. Low energy transients like GRB 060218 may be the most common events in the Universe. Author
Gamma Ray Bursts; Supernovae; Universe; Astronomy

20060022647 National Optical Astronomy Observatories, Tucson, AZ, USA, National Solar Observatory, Tucson, AZ, USA
NOAO/NSO Newsletter: Issue 86
June 2006; 50 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

The science highlights covered in this issue from the National Optical Astronomy Observatory (NOAO) are: Using the 'NOAO System' of Small and Large Telescopes The First Complete Solar Cycle of GONG Discovery of the First Radio-Loud Quasar at z \g 6, Reversed Granulation and Gravity Waves The Volume-Averaged Properties to Investigate Young Brown Dwarfs Observations of Solar Convection Zone Dynamics in the Mid-Photosphere of Luminous Galaxies at z \h 3. Other articles review operations at the NOAO Gemini Science Center, Cerro Tololo Inter-American Observatory, Kitt Peak National Observatory, National Solar Observatory/GONG.
CASI
Observatories; Solar Observatories; Telescopes

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20060022170 NASA Ames Research Center, Moffett Field, CA, USA
Complex Organic Materials on Planetary Satellites and Other Small Bodies of the Solar System
Cruikshank, Dale P.; [2006]; 1 pp.; In English; American Astronomical Society, 5-8 Jun. 2006, Calgary, Alberta, Canada; No Copyright; Avail.: Other Sources; Abstract Only

The search for organic materials on small bodies of the Solar System is conducted spectroscopically from Earth-based telescopes and from spacecraft. Although the carbonaceous meteorites carry a significant inventory of complex organic solids, the sources of these meteorites have not been identified. Infrared spectra of a sample of the suspected sources, the C- and D-class asteroids, including new data from the Spitzer Space Telescope, show signatures of silicates, but none diagnostic of organic compounds. In the absence of discrete spectral features, the low albedos and colors in the visible and near-IR spectral regions are the principal links between the organic-bearing meteorites and the asteroids. While Pluto and a few trans-neptunian objects show spectral signatures of frozen CH4. Solid CH3OH has been identified on two Centaur objects in the outer Solar System. In some cases the red colors of those objects suggest the presence of tholins. The VIMS instrument aboard the Cassini spacecraft in orbit around Saturn has detected near-IR spectral features on at least three of Saturn's satellites that are indicative or suggestive of organic molecules. One entire hemisphere of the satellite Iapetus is covered with low-albedo material that shows a spectral signature of aromatic hydrocarbons (3.3 microns) and the -CH2 stretching mode bands of an aliphatic component. Organics absorbing at 3.44 microns are suspected in the region of the south pole of Enceladus, and also on the surface of Phoebe. Organic material may originate on icy bodies in the current epoch by various processes of energy deposition into native material, or they may fall to the surface from an external (probably cometary) source. Some organic material may be pre-solar, having originated in the interstellar medium before the formation of the Solar System. Using the techniques of remote sensing, its detection and analysis are slow and difficult.
Author
Carbonaceous Meteorites; Asteroids; Organic Materials; Methane; Interstellar Matter; Near Infrared Radiation; Methyl Alcohol; Hydrocarbons

20060022515 California Univ., Berkeley, CA, USA
The Galactic Black Hole Transient H1743-322 During Outburst Decay Connections Between Timing Noise, State Transitions, And Radio Emission
Kalemci, E.; Tomsick, J. A.; Corbel; Kaaret, P.; Rothschild, R. E.; Pottschmidt, K.; The Astrophysical Journal; March 1, 2006; Volume 639, pp. 340-347; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAS5-30720; NAG5-13142; NNG04GB19B; Copyright; Avail.: Other Sources

Multiwavelength observations of Galactic black hole transients during outburst decay are instrumental for our understanding of the accretion geometry and the formation of outflows around black hole systems. H1743-322, a black hole transient observed intensely in X-rays and also covered in the radio band during its 2003 decay, provides clues about the

changes in accretion geometry during state transitions and also the general properties of X-ray emission during the intermediate and low-hard states. In this work, we report on the evolution of spectral and temporal properties in X-rays and the flux in the radio band, with the goal of understanding the nature of state transitions observed in this source. We concentrate on the transition from the thermal dominant state to the intermediate state that occurs on a timescale of 1 day. We show that the state transition is associated with a sudden increase in power-law flux. We determine that the ratio of the power-law flux to the overall flux in the 3-25 keV band must exceed 0.6 for us to observe strong timing noise. Even after the state transition, once this ratio was below 0.6, the system transited back to the thermal dominant state for 1 day. We show that the emission from the compact radio core does not turn on during the transition from the thermal dominant state to the intermediate state but does turn on when the source reaches the low-hard state, as seen in 4U 1543-47 and GX 339-4. We find that the photon index correlates strongly with the QPO frequency and anticorrelates with the rms amplitude of variability. We also show that the variability is more likely to be associated with the power-law emission than the disk emission.
Author
X Rays; Black Holes (Astronomy); Radio Frequency Interference; Radio Emission

20060022605 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Rapid Identification of GRB Afterglows with Swift/UVOT
Marshall, F. E.; [2006]; 4 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

As part of the automated response to a new gamma-ray burst (GRB), the Ultraviolet and Optical Telescope (UVOT) instrument on Swift starts a 200-second exposure with the V filter within approximately 100 seconds of the BAT burst trigger. The instrument searches for sources in a 8' x 8' region, and sends the list of sources and a 160' x 160' sub-image centered on the burst position to the ground via Tracking and Data Relay Satellite System (TDRSS). These raw products and additional products calculated on the ground are then distributed through the GCN within a few minutes of the trigger. We describe the sensitivity of these data for detecting afterglows, summarize current results, and outline plans for rapidly distributing future detections.
Author
Afterglows; Gamma Ray Bursts; Identifying; Gamma Ray Astronomy; Spaceborne Astronomy; Gamma Ray Sources (Astronomy)

20060022695 Stanford Linear Accelerator Center, Stanford, CA, USA, Akademiya Nauk SSSR, Novosibirsk, Russian Federation
Dissipation of Magnetohydrodynamic Waves on Energetic Particles: Impact on Interstellar Turbulence and Cosmic Ray Transport
Ptuskin, V. S.; Moskalenko, I. V.; Jones, F. C.; Strong, A. W.; Zirakashvili, V. N.; Jan. 2006; 38 pp.; In English
Report No.(s): DE2006-876043; No Copyright; Avail.: Department of Energy Information Bridge

The physical processes involved in diffusion of Galactic cosmic rays in the interstellar medium are addressed. We study the possibility that the nonlinear MHD cascade sets the power-law spectrum of turbulence which scatters charged energetic particles. We find that the dissipation of waves due to the resonant interaction with cosmic ray particles may terminate the Kraichnan-type cascade below wavelengths 10(sup 13) cm. The effect of this wave dissipation has been incorporated in the GALPROP numerical propagation code in order to asses the impact on measurable astrophysical data. The energy-dependence of the cosmic-ray diffusion coefficient found in the resulting self-consistent model may explain the peaks in the secondary to primary nuclei ratios observed at about 1 GeV/nucleon.
NTIS
Cosmic Rays; Magnetohydrodynamic Waves; Magnetohydrodynamics; Turbulence

91
LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

20060021587 NASA Johnson Space Center, Houston, TX, USA
Ar-Ar Dating of Martian Meteorite, Dhofar 378: An Early Shock Event?
Park, J.; Bogard, D. D.; [2006]; 2 pp.; In English; 30th Symposium on Antarctic Meteorites, 6-8 Jun. 2006, Tokyo, Japan; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

Martian meteorite, Dhofar 378 (Dho378) is a basaltic shergottite from Oman, weighing 15 g, and possessing a black fusion crust. Chemical similarities between Dho378 and the Los Angeles 001 shergottite suggests that they might have derived from the same Mars locale. The plagioclase in other shergottites has been converted to maskelenite by shock, but Dho378 apparently experienced even more intense shock heating, estimated at 55-75 GPa. Dho378 feldspar (approximately 43 modal %) melted, partially flowed and vesiculated, and then partially recrystallized. Areas of feldspathic glass are appreciably enriched in K, whereas individual plagioclases show a range in the Or/An ratio of approximately 0.18-0.017. Radiometric dating of martian shergottites indicate variable formation times of ~160-475 Myr, whereas cosmic ray exposure (CRE) ages of shergottites indicate most were ejected from Mars within the past few Myr. Most determined Ar-39-Ar-40 ages of shergottites appear older than other radiometric ages because of the presence of large amounts of martian atmosphere or interior Ar-40. Among all types of meteorites and returned lunar rocks, the impact event that initiated the CRE age very rarely reset the Ar-Ar age. This is because a minimum time and temperature is required to facilitate Ar diffusion loss. It is generally assumed that the shock-texture characteristics in martian meteorites were produced by the impact events that ejected the rocks from Mars, although the time of these shock events (as opposed to CRE ages) are not directly dated. Here we report Ar-39-Ar-40 dating of Dho378 plagioclase. We suggest that the determined age dates the intense shock heating event this meteorite experienced, but that it was not the impact that initiated the CRE age.
Author
Chronology; Shergottites; Basalt; Argon Isotopes; SNC Meteorites; Shock Heating

20060021592 NASA Johnson Space Center, Houston, TX, USA
International Research on ISS - the Benefits of Working Together
Uri, John J.; Thomas, Donald A.; [2005]; 1 pp.; In English; 15th International Academy of Astronautics Humans in Space Symposium, 22-26 May 2005, USA; No Copyright; Avail.: Other Sources; Abstract Only

International Space Station is the most complex multinational cooperative space endeavor in history. Interagency agreements define utilization accommodations and resources available to each partner. Based on these arrangements, the partners select and implement research to meet agency goals and objectives. But to optimize the limited resources available to utilization, cooperation among the partners is essential. This paper describes various avenues available for partner cooperation and provides specific examples to demonstrate the value of such cooperation to accelerate and enhance science return.
Derived from text
International Space Station; International Cooperation; Space Missions

20060021611 Nautical Almanac Office, Washington, DC, USA, Rutherford Appleton Lab., Chilton, UK
Nautical Alamanac for the Year 2007
January 2006; 368 pp.; In English
Report No.(s): PB2006-110485; NAUTALMANAC-07; Copyright; Avail.: National Technical Information Service (NTIS)

;Contents: Title page, preface, etc.; Phases of the Moon; Calendars; Eclipses; Planet notes and diagram; Daily pages: Ephemerides of Sun, Moon, Aries and planets; sunrise, sunset twilights, moonrise, moonset, etc.; Explanation; Standard times; Star charts; Stars: SHA and Dec of 173 stars, in order of SHA (accuracy O'1); Polaris (Pole Star) tables; Sight reduction procedures; direct computation; Concise sight reduction tables; Form for use with concise sight reduction tables; Conversion of arc to time; Tables of increments and corrections for Sun, planets, Aries, Moon; Tables for interpolating sunrise, sunset, twilights, moonrise, moonset, Moon's meridian passage; Index to selected stars; Altitude correction tables for the Moon.
NTIS
Astronomical Catalogs; Celestial Navigation; Surface Navigation

20060022067 NASA Johnson Space Center, Houston, TX, USA
Sedimentary Rocks and Methane - Southwest Arabia Terra
Allen, Carlton C.; Oehler, Dorothy Z.; Venechuk, Elizabeth M.; [2006]; 1 pp.; In English; 1st Landing Site Worksop for 2009 Mars Science Lab, 31 Mar. - 2 Jun. 2006, Pasadena, CA, USA; No Copyright; Avail.: CASI: A01, Hardcopy

We propose to land the Mars Science Laboratory in southwest Arabia Terra to study two key aspects of martian history the extensive record of sedimentary rocks and the continuing release of methane. The results of this exploration will directly address the MSL Scientific Objectives regarding biological potential, geology and geochemistry, and past habitability.
Author
Mars (Planet); Methane; Saudi Arabia; Sedimentary Rocks

20060022081 NASA Johnson Space Center, Houston, TX, USA

Sm-Nd Age and Nd- and Sr- Isotopic Evidence for the Petrogenesis of Dhofar 378

Nyquist, L. E.; Ikeda, Y.; Shih, C.-Y.; Reese, Y. D.; Nakamura, N.; Takeda, H.; [2006]; 2 pp.; In English; 30th Symposium on antarctic Meteorites, 6-8 Jun. 2006, Tokyo, Japan; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Dhofar 378 (hereafter Dho 378) is one of the most ferroan lithologies among martian meteorites, resembling the Los Angeles basaltic shergottite in lithology and mineral chemistry, although it is more highly shocked than Los Angeles. All plagioclase (Pl) grains in the original lithology were melted by an intense shock in the range 55-75 GPa. Clinopyroxenes (Cpx) sometimes show mosaic extinction under a microscope showing that they, too, experienced intense shock. Nevertheless, they zone from magnesian cores to ferroan rims, reflecting the original lithology. Cpx grains also often contain exsolution lamellae, showing that the original lithology cooled slowly enough for the lamellae to form. Because all plagioclase grains were melted by the intense shock and subsequently quenched, the main plagioclase component is glass (Pl-glass) rather than maskelynite. Like Los Angeles, but unlike most basaltic shergottites, Dho 378 contains approximately equal modal abundances of Cpx and Pl-glass. The grain sizes of the original minerals were comparatively large (approximately 1 mm). The original plagioclase zoning has been severely modified. Following shock melting, the plagioclase melts crystallized from the outside inward, first forming outer rims of Cpx-Pl intergrowths (approximately 10 micrometers) followed by inner rims (10's to 100 micrometers) of An(sub 40-50) feldspar, and finally Pl-gl cores of compositions An(sub 33-50) with orthoclase compositions up to Or(sub 12).

Author

Lithology; Petrogenesis; SNC Meteorites; Geochronology; Mineralogy; Samarium Isotopes; Neodymium Isotopes; Strontium Isotopes

20060022554 NASA Johnson Space Center, Houston, TX, USA

Habitability Designs for Crew Exploration Vehicle

Woolford, Barbara; [2006]; 1 pp.; In English; Human Factors and Ergonomics Society 50th Annual, 16-20 Oct. 2006, San Francisco, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

NASA's space human factors team is contributing to the habitability of the Crew Exploration Vehicle (CEV), which will take crews to low Earth orbit, and dock there with additional vehicles to go on to the moon's surface. They developed a task analysis for operations and for self-sustenance (sleeping, eating, hygiene), and estimated the volumes required for performing the various tasks and for the associated equipment, tools and supplies. Rough volumetric mockups were built for crew evaluations. Trade studies were performed to determine the size and location of windows. The habitability analysis also contributes to developing concepts of operations by identifying constraints on crew time. Recently completed studies provided stowage concepts, tools for assessing lighting constraints, and approaches to medical procedure development compatible with the tight space and absence of gravity. New work will be initiated to analyze design concepts and verify that equipment and layouts do meet requirements.

Author

Habitability; Crew Exploration Vehicle; Human Factors Engineering; Systems Engineering

20060022555 NASA Johnson Space Center, Houston, TX, USA

Tracking the Early Thermal History of Asteroids with Trace Siderophiles in Meteorite Metals

Herrin, J. S.; Mittlefehldt, D. W.; Humayun, M.; [2006]; 1 pp.; In English; 3rd International Workshop/Highly Siderophile Element Geochem, 5-7 Jul. 2006, Durham, UK; No Copyright; Avail.: Other Sources; Abstract Only

A fundamental process in the formation of differentiated bodies is the segregation of metal-sulfide and silicate phases, leading to the formation of a metallic core. The only known direct record of this process is preserved in some primitive achondrites, such as the acapulcoites and lodranites. These meteorites, thought to originate from the same parent asteroid, are the products of thermal metamorphism and igneous processing of a chondritic precursor. Collectively, they have experienced a range of peak metamorphic temperatures relevant to the onset of metal-sulfide partial melting and melt migration. We assessed the siderophile element composition of their metals in an effort to determine the conditions and extent of metal-sulfide melt extraction and thereby gain insight into the earliest stages of core formation.

Derived from text

Asteroids; Metals; Meteoritic Composition; Siderophile Elements; Thermal Analysis

20060022692 NASA Ames Research Center, Moffett Field, CA, USA
Sample Return from the Stardust Mission
[2006]; 1 pp.; In English
Contract(s)/Grant(s): WBS 21-624-08-01; No Copyright; Avail.: Other Sources; Abstract Only

On January 2,2004, the STARDUST spacecraft made a close flyby (236 km) of the nucleus of a comet - Comet Wild 2. During the flyby the spacecraft collected samples of dust from the coma of the comet. These samples were successfully returned to Earth on January 15,2006. After a six month preliminary examination to establish the nature of the returned samples, they will be made available to the general scientific community for study. STARDUST is one of the missions carried out under NASA's Discovery Mission Program. During my talk I will present a brief overview of the scientific goals of the STARDUST mission and describe the mission's design and flight. I will also discuss the reentry and recovery of the Stardust Sample Return Capsule (SRC) in Utah, with an emphasis on those aspects of the recovery important for minimizing the degree of contamination (particularly organic contamination) of the samples. Finally, I will discuss some of the results coming out of the preliminary examination of the returned samples, with an emphasis on the nature of organic materials found in the samples.
Author
Flyby Missions; Sample Return Missions; Stardust Mission; Cosmic Dust

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20060022076 Science Applications International Corp., San Diego, CA, USA
The Latitudinal Excursion of Coronal Magnetic Field Lines in Response to Differential Rotation: MHD Simulations
Lionello, Roberto; Linker, Jon A.; Mikic, Zoran; Riley, Pete; The Astrophysical Journal; April 11, 2006; Volume 642; 4 pp.; In English
Contract(s)/Grant(s): NNH04CC04C; Copyright; Avail.: Other Sources

Solar energetic particles, which are believed to originate from corotating interacting regions (CIRS) at low heliographic latitude, were observed by the Ulysses spacecraft even as it passed over the Sun's poles. One interpretation of this result is that high-latitude field lines intercepted by Ulysses connect to low-latitude CIRs at much larger heliocentric distances. The Fisk model explains the latitudinal excursion of magnetic field lines in the solar corona and heliosphere as the inevitable consequence of the interaction of a tilted dipole in a differentially rotating photosphere with rigidly rotating coronal holes. We use a time-dependent three-dimensional magnetohydrodynamic (MHD) algorithm to follow the evolution of a simple model of the solar corona in response to the differential rotation of the photospheric magnetic flux. We examine the changes of the coronal-hole boundaries, the redistribution of the line-of-sight magnetic field, and the precession of field lines in the corona. Our results confirm the basic idea of the Fisk model, that differential rotation leads to changes in the heliographic latitude of magnetic field lines. However, the latitudinal excursion of magnetic field lines in this simple 'tilted dipole' model is too small to explain the Ulysses observations. Although coronal holes in our model rotate more rigidly than do photospheric features (in general agreement with observations), they do not rotate strictly rigidly as assumed by Fisk. This basic difference between our model and Fisk's will be explored in the future by considering more realistic magnetic flux distributions, as observed during Ulysses polar excursions.
Author
Coronal Holes; Energetic Particles; Magnetic Fields; Magnetohydrodynamics; Solar Corona; Solar Magnetic Field; Solar Wind

20060022159 NASA Marshall Space Flight Center, Huntsville, AL, USA
A Comparison of Rome Observatory Sunspot Area and Sunspot Number Determinations With International Measures, 1958-1998
Wilson, Robert M.; Hathaway, David H.; November 2005; 24 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/TP-2005-214191; M-1153; No Copyright; Avail.: CASI: A03, Hardcopy

Two changes in recording the sunspot record have occurred in recent years. First, in 1976, the longer-than-100-yr daily photographic record of the Royal Greenwich Observatory (RGO), used for determination of numbers and positions of sunspot groups and sunspot areas ended, and second, at the end of 1980, after more than 130 years, Zurich s Swiss Federal Observatory stopped providing daily sunspot numbers. To extend the sunspot record beyond 1976, use of USA Air Force/National Oceanic

and Atmospheric Administration (USAF/NOAA) sunspot drawing observations from the Solar Optical Observing Network began in 1977, and the combined record of sunspot activity from RGO/USAF/NOAA was made accessible at http://science.nasa.gov/ssl/PAD/SOLAR/greenwch.htm. Also, in 1981, the task of providing daily sunspot numbers was taken up by the Royal Observatory of Belgium s Solar Influences and Data analysis Center, and the combined Zurich/International sunspot number database was made available at http://sidc.oma.be/index.php3. In this study, Rome Observatory 1958-1998 photographic records of sunspot areas, numbers of groups, and derived sunspot numbers are compared against same-day international values to determine relative behaviors and to evaluate whether any potential changes might have been introduced in the overall sunspot record, due to the aforementioned changes.
Author
Sunspots; Observatories; Solar Cycles; Data Bases; Photographs

20060022553 Houston Univ., TX, USA
Use of FlUKA in the Analysis of the Mars Odyssey MARIE Experiment
Pinsky, Lawrence S.; Wilson, Thomas L; Andersen, Victor; Annual Report, Institute of Space Systems Operations; [2006]; 3 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 101-60-15; No Copyright; Avail.: CASI: A01, Hardcopy

UH researchers have significantly improved the calibration of the MARIE by simulating its response to energetic protons using FLUKA. Analysis of MARIE data shows that the intensity of solar energetic particles depends strongly on how well the observation point is connected magnetically to the site at which the particles are accelerated.
Author
2001 Mars Odyssey; Telescopes; Spaceborne Experiments; Solar Physics; Extraterrestrial Radiation

93
SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20060022181 NASA Johnson Space Center, Houston, TX, USA
Historical Study of Radiation Exposures and the Incidence of Cataracts in Astronauts
Cucinotta, F. A.; Manuel, F. K.; Iszard, G.; Feiveson, A.; Peterson, L. E.; Hardy, D.; Marak, L.; Tung, W.; Wear, M.; Chylack, L. T., Jr.; [2004]; 1 pp.; In English; ISOT, 19-20 Oct. 2004, Fort Worth, TX, USA; Copyright; Avail.: Other Sources; Abstract Only

For over 35 years, astronauts in low Earth orbit or on missions to the moon have been exposed to space radiation comprised of high-energy protons, heavy ions, and secondary neutrons. We reviewed the radiation exposures received by astronauts in space and on Earth, and presented results from the first epidemiological study of cataract incidence in the astronauts. Our data suggested an increased risk for cataracts from space radiation exposures. Using parametric survival analysis and the maximum likelihood method, we estimated the dose-response and age distribution for cataract incidence in astronauts by space radiation. Considering the high-LET dose contributions on specific space missions as well as data from animal studies with neutrons and heavy ions, suggested a linear response with no dose-threshold for cataracts. However, there are unanswered questions related to the importance and the definition of clinically significant cataracts commonly used in radiation protection, especially in light of epidemiological data suggesting that the probability that sub-clinical cataracts will progress is highly dependent on the age at which cataracts appear. We briefly describe a new study that will address the measurement of cataract progression-rates in astronauts and a ground-based comparison group.
Author
Astronauts; Cataracts; Extraterrestrial Radiation; Histories; Radiation Dosage

99
GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20060022682 NASA, Washington, DC, USA

Breaking in the Space Shuttle

Crippen, Robert; [2005]; 6 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hard-copy

Robert Crippen, in this presentation discusses his experience in the NASA astronaut corps, how he was selected, and the expansion of the corp to include mission specialist, and women.

CASI

Astronauts; Pilots (Personnel); Spacecrews

Subject Term Index

Personal Author Index